# PATENT ABSTRACTS OF JAPAN

(11)Publication number:

11-223821

(43)Date of publication of application: 17.08.1999

(51)Int.Cl.

G02F 1/1339 CO8F292/00

(21)Application number : 10-147520

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(22)Date of filing:

28.05.1998

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(30)Priority

Priority number: 09335828

Priority date: 05.12.1997

Priority country: JP

09188353

14.07.1997

(54) SPACER FOR LIQUID CRYSTAL DISPLAY ELEMENT AND LIQUID CRYSTAL DISPLAY

# **ELEMENT USING THAT** (57)Abstract:

PROBLEM TO BE SOLVED: To add functions such as a preventing performance against abnormal orientation and an adhesive performance to a shell layer while maintaining the mechanical strength required for a spacer by reacting an oxidant with fine particles each having reducing groups on the surface to produce radicals on the particle surface and forming a polymer layer by using the radicals as the starting point on the particle surface. SOLUTION: An oxidant is reacted with fine particles each having reducing groups on the surface to produce radicals on the particle surface. Then polymerizable monomers are reacted by using the radicals as the starting point to form a polymer layer on the particle surface. As for the oxidant, for example, persulfates, cerium salt, hydrogen peroxide, dimethylaniline, sodium periodate, potassium permanganate and alkylboron and used. Further, an acid such as nitric acid

or its salt may be added so as to increase the reaction rate of the polymer system. As for the reducing groups, for example, hydroxyl groups, thiol groups, aldehyde groups, mercapto groups

# **LEGAL STATUS**

[Date of request for examination]

and amino groups are used.

17.08.2000

[Date of sending the examiner's decision of

rejection]

[Kind of final disposal of application other than

the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

3333134

[Date of registration]

26.07.2002

[Number of appeal against examiner's decision

of rejection

[Date of requesting appeal against examiner's

decision of rejection]
[Date of extinction of right]

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## CLAIMS

[Claim(a)]
[Claim(a)]
[Claim(b)] The spacer for liquid crystal display components characterized by making an exidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making it come with this radical as the starting point to form a polymerization layer in said particle front face.
[Claim 2] The spacer for liquid crystal display components according to claim 1 whose exidizer is

a cerium salt.
[Claim 3] The spacer for liquid crystal display components characterized by making it come by
making an oxidizing agent react to the particle which has a reducibility radical on a front face,
making said particle front face generate a radical, and making the polymerization nature monor

making said particle front face generate a radical and making the polymerization nature monomer which has an epony group with this radical as the starting point react to form a reactant graft polymerization layer in said particle front face.

[Claim 4] The spacer for liquid crystal display components characterized by making it come by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has the polymerization nature monomer and ethylene glycol radical which have an epoxy group with this radical as the starting point react to form a reactant graft polymerization layer in said particle front face. said particle front face.

said particle front face.

[Claim 5] The spacer for liquid crystal display components characterized by making it come by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a long—thain shilly group with this radical as the starting point react to form in said particle front face the graft polymerization layer which has a long—chain alkyl group.

[Claim 6] The spacer for liquid crystal display components which is made to form in said particle front face the graft polymerization layer which has a functional group, and is further characterized by to make a long—chain alkyl compound come to react to the graft polymerization layer which has said functional group by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a functional group with this radical as the starting point react.

making the polymerization nature monomer which has a functional group with this radical as the starting point react.

[Claim 7] By making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a functional group with this radical as the starting point react. The graft polymerization tayer which has a functional group is made to form in said particle front face. Further By making the polymerization nature monomer which has an epoxy group exact to it, after introducing the active group which has a polymerization nature winyl group and/or polymerization initiation shiftly into the graft polymerization layer which has said functional group. The spacer for liquid crystal display components characterized by making it come to form the graft polymerization layer which has an epoxy group in the graft polymerization layer front face which has said functional group.

[Claim 8] By making an oxidizing agent react to the particle which has a reducibility radical on a

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front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a functional group with this radical as the starting point react The graft polymerization layer which has a functional group is made to form in said particle front face. graft polymerization layer which has a functional group is made to form in said particle front face. Further By making the polymerization nature monomer which has a long-chain alkyl group react to it, after introducing the active group which has a polymerization nature viryl group and/or polymerization initiation ability into the graft polymerization layer which has said functional group The spacer for fauld crystal display components characterized by making it come to form the graft polymerization layer which has a long-chain alkyl group in the graft polymerization layer front face which has said functional group.

[Claim 9] The liquid crystal display component characterized by for two glass substrates with which the orientation film and a transparent electrode have been arranged countering through

the spacer for liquid crystal display components according to claim 1, 2, 3, 4, 5, 6, 7, or 8, and enclosing liquid crystal between said glass substrates.

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### DETAILED DESCRIPTION

[Detailed Description of the Invention]

(Field of the Invention) This invention relates to the liquid crystal display component which used the spacer for liquid crystal display components, and it.

the spacer for liquid crystal display components, and it. [0002]
[Description of the Prior Art] The liquid crystal display component in the Twisted Nematic [TN] mode using the conventional spacer. The pneumatic liquid crystal 11 enclosed between one pair of substrates 8 and 10, and these substrates 8 and 10 as shown in drawing 1. In order to make into a component the seal member 1 with which the perimeter of substrates 8 and 10 was filled up, and the poterization sheets 12 and 13 covered by the front face of substrates 8 and 10 was filled up, and the poterization sheets 12 and 13 covered by the front face of substrates 8 and 10 and to hold uniformly the gap between the one abover-mentioned pair of substrates 8 and 10, the spacer 9 is arranged between a substrate 8 and 10 from the pattern of the transparent electrodes 3 and 6 which become one side of the glass transparence substrates 2 and 5 from the ITO film etc., and are obtained by covering the orientation control fain 4 and 7 which becomes the front face of these transparent electrodes 3 and 6 and the transparence substrates 2 and 5 from the polyminds film etc. Orientation control from the polyminds film etc. Orientation control recessing is performed to the above-mentioned orientation control film 4 and 7 by rubbing. [0004] Generally as the above-mentioned charge of spacer 9 material, organic or an inorganic material is used. As a spacer of an inorganic material, the thing containing an aluminum oxide, a silicon dioxide, etc. is mentioned (for example, reference, such as UP,83-73225A and JP.1-959974A.) However, since the orientation film was damaged since the degree of hardness is high or the thickness charge by thermal expansion and contraction was not able to follow in footsteps of a substrate easily, the spacer of the conventional inorganic material caused poor pap unevenness.

footsteps of a substrate easily, the spacer of the conventional inorganic material caused poor gap unevenness.

(0005) Moreover, the spacer of an organic material has the moderate degree of hardness which does not damage the orientation film, tends to follow in footsteps of change of the thickness by thermal expansion or the heat shrink, and has the descriptions, like there is still less spacer migration within a cel, and the polymer of a polystyrene system or a benzoguanamine system is mainly used (for example, reference, such as JP.80-200228,A and JP.1-293318,A). (0006) However, the liquid crystal display produced using the above-mentioned spacer had the problem that the abnormality orientation of liquid crystal occurred in the circumference of a liquid crystal spacer, immediately after production of a cel (henceforth a "initial state"), and after high-voltage impression. In the display which used especially super-twisted-mematic (STN) liquid crystal, the inclination became remarkable and there was a trouble that a homogeneous image could not be held. The cause of this shoromality orientation is for a liquid crystal molecule to carry out orientation to the circumference of a spacer, and the size of this abnormality orientation is further presumed to be a thing depending on extent of the orientation of a liquid crystal molecule.

orientation is traveled presumed to be a uning departuring on extent or one orientation of a inqui-crystal molecule.

[0007] In order to solve such abnormality orientation, the dielectric constant (refer to JP,6-67182A) of a spacer and examination which changes a spacer surface presentation (refer to

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front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a long-chain alkyl group with this radical as the starting point react. (0017) The spacer for liquid crystal display components according to claim 6 (henceforth "this invention 5") By making an oxidizing agent react to the particle which has a raducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a functional group with this radical as the starting point react it is the spacer for liquid crystal display components which is made to form in said particle front face the graft polymerization alkyl compound come to react to the graft polymerization layer which has a functional group, and is further characterized by making a long-chain alkyl compound come to react to the graft polymerization layer which has said functional group.

[0018] The spacer for liquid crystal display components according to claim 7 (henceforth "this invention 6") By making an oxidizing agent react to the particle which has a raducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomor which has a functional group with this radical as the starting point react. The graft polymerization layer which has a functional group is made to form in said particle front face. Further By making the polymerization nature monomer which has an epoxy group react to it, after introducing the active group which has a polymerization nature wing group and/or polymerization initiation ability into the graft polymerization layer which has as a functional group.

It is the spacer for liquid crystal display components according to claim 8 (henceforth "this invention"). By making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has a functional grou

from the which has said functional group.

[10020] A liquid crystal display component (henceforth "this invention 8") according to claim 9 a liquid crystal display component characterized by for two glass substrates with which the orientation film and a transparent electrode have been arranged countering through the spacer

a louid crystal display component characterized by for two glass substrates with which the orientation film and a transparent electrode have been erranged countering through the spacer for liquid crystal display components according to claim 1, 2, 3, 4, 5, 6, 7, or 8, and enclosing liquid crystal display components according to claim 1, 2, 3, 4, 5, 6, 7, or 8, and enclosing liquid crystal between said glass substrates.

[0021] The spacer for liquid crystal display components of this invention 1 makes it come to form the shell layer which consists of a polymerization nature monomer in the front face of the particle his in the so-called core shell type of spacer, and is a core [0022]. Since the particle used in this invention 1 functions as a core particle of the spacer for figuid crystal display components, verious ergies performance is required in particle size, particle size distribution, dynamics reinforcement, etc. [0023] The particle size of the above-mentioned particle has desirable 1-10 micrometers. The particle size distribution of the above-mentioned particle is the CV value which broke standard devisition by particle size, and is desirable. [10% or less of ] As for the dynamics reinforcement of the above-mentioned particle, it is desirable that 10% K value is 250-1000. Since the reinforcement of a particle was not enough, in case a liquid crystal display component was constructed as it is less than 250, when a spacer is destroyed, and a suitable galo does not come out, but 1000 was exceeded and it includes in a liquid crystal display component, the orientation film on a substrate is damaged and the abnormalities in a display occur. [0024] in addition, above-mentioned 10% K value — the Patent Publication Heisei No. 503180 [six to ] official report — being based — a minute compression test machine (PCT-200, Shimadzu Corp. make) — using — the smooth end face of a cylinder with a diameter [made

JP.8-118421.A) are performed. However, in order to prevent abnormality orientation, after changing the presentation of a polymer a lot, it became a brittle particle without reinforce required for a spacer, and there was a problem destroyed in case a fauid crystal display. at is constructed

component is constructed.

[0008] Moreover, migration of a spacer took place by vibration at the time of impregnation of figuid crystal and the conveyance after production etc., and the liquid crystal display produced using the conventional spacer had the problem from which this migration part serves as display nonuniformity. Especially, by the spread of television for mount, nevigation systems, etc., since the use opportunity of the liquid crystal display in the intense location of vibration is increasing, recent years require the adhesion beyers which have the adhesion over a substrate on a particle front face, such as synthetic resin of a low-most point, and a wax, to such a demand — although — it is proposed (refer to 19.83–94224.A). However, such a spacer had the problem of an adhesion haver having enfoliated [ tend ] from a particle front face, and the adhesion bayer which exfoliated having mixed in liquid crystal, and reducing the display engine performance of a liquid crystal display.

[00101] Then, the so-called core shell type which considers only a particle front face as the

performance of a bigad crystal display.

(D010) Then, the sprealled core shell type which considers only a particle front face as the presentation suitable for abnormality orientation prevention and the presentation excellent is adhesion of spacer is examined with reinforcement with the sufficient interior of a particle However, the whole front face could not be embellished in homogeneity, and the problem of actuation of a complicated multistage story being required was left behind to making a shell become (0011)

Problem(a) to be Solved by the Invention] This invention aims at offering the spacer for liquid crystal display components of the core shell type which gave functionality, such as abnormality orientation prevention engine performance and adhesive ability, to the shell layer, and the liquid crystal display component using it, holding the dynamics reinforcement needed for a spacer in rw of the above [0012]

[0012] Means for Solving the Problem] The spacer for liquid crystal display components according t claim I (henceforth "this invention I") is a spacer for liquid crystal display components which makes an oxidizing agent react to the particle which has a reducibility radical on a front face, makes the abover-mentioned particle front face generates a radical, and makes it come with the radical as the starting point to form a polymerization layer in the abover-mentioned particle for face.

face. [0013] The spacer for liquid crystal display components according to claim 2 is a spacer for liquid crystal display components according to claim 1 whose oxidizer is a cerium salt. [0014] The spacer for liquid crystal display components according to claim 3 (henceforth "this invention 2") is a spacer for liquid crystal display components characterized by making it come to form a reactant graft polymerization layer in said particle front face by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle

agent react to the particle which has a reducibility radical on a front face, making said particle front face generate a radical, and making the polymerization nature monomer which has an epoxy group with this radical as the starting point react. [0015] The spacer for liquid crystal display components according to claim 4 (henceforth "this invention 3") Make an oxidizing agent react to the particle which has a reducibility radical on a front face, make said particle front face generate a radical to it, and it starts from this radical to it. By making the polymerization nature monomer which has the polymerization nature monomer and ethylene glycol radical which have an epoxy group react, it is the spacer for liquid crystal display components characterized by making it come to form a reactant graft polymerization layer in said particle front face.

(016) The spacer for Ruid crystal display components according to claim 5 (henceforth "the invertion 4") is a spacer for Ruid crystal display components characterized by making it conform in said particle front face the graft polymerization layer which has a long-chain alkyl group by making an oxidizing agent react to the particle which has a roducibility radical on a

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from a diamond ] of 50 micrometers — it is — the above-mentioned particle — the compression degree of hardness of 0.27g/second, and the maximum trial — too heavy — it is the value which compresses by 10g and is calculated from the following formula.

[0025] R-1[ K= (3/root/2) and F-S-3/2 and J/2F: The too heavy value in 10% compression set of

a particle (bg)

5: the compression in 10% compression set of a particle — a variation rate (mm)

6: The radius of a particle (mm)

[0026] In this invention 1, the above-mentioned particle has a reducibility radical on a front face. to the control of the specialty as the above—mentioned reducibility radical, for example, a hydroxyl group, a thiol group, an aldehyde group, a sufflydryl group, the arising group, etc. are mentioned (0021) The approach using the approach rearromolecule protective agent are not finited especially as an approach of obtaining the particle which has the above—mentioned reducibility especially as an approach of obtaining the particle which has the above-mentioned reducibility radical on a front face, for example, according to polymerization methods, such as an emulsion polymerization, a distributed polymerization, a distributed polymerization the approach using a surfactant etc. is mentioned. Moreover, the non-subtlety particle which has the above-mentioned reducibility radical on a front face may be used.

(0028) As an approach by the describing ( above ) polymerization method, copolymerization of a reducibility radical content monomer, and the above—mentioned reducibility radical content monomer, the monomer of copolymerizable others and/or the above—mentioned reducibility radical content monomer and a copolymerizable cross—linking monomer is carried out, for example, and a particle is obtained.

example, and a particle is obtained.

[0029] It is not limited especially as a reducibility radical of the above-mentioned reducibility radical content monomer, for example, a hydroxyl group, a thiol group, an aldehyde group, a sulfhydryl group, the amine group, etc. are mentioned, it is not limited especially as the above-mentioned reducibility radical content monomer, for example, acrylic ester (meta) derivative; styrene derivative; vinyl ester; conjugated denes, such as hydroxyethyl (meta) acrylate, hydroxyptopyl (meta) acrylate, hydroxy butyl (meta) acrylate, 2-methacryloloxy-ethyl succinic ecid, a 2-methacryloloxy-ethyl succinic ecid, a 2-methacryloloxy-ethyl side phosphate, glycerol monochrome (meta) acrylate, and GURISERDNJI (meta) acrylate, are mentioned.

[0030] If it is not limited especially as the above-mentioned reducibility radical content monomer and a monomer of conobmerizable others but the particle of a macromolecule is obtained For gycerol monocurrone (meta) acrystate, and GUIGS-RINII (meta) acrystate, are mentioned. (1003) If it is not limited especially as the above-mentioned reducibility radical content monomer and a monomer of copolymerizable others but the particle of a macromolecule is obtained for example, styrene, alpha methyl styrene, preshors styrene, prohors otyrene, Styrene derivatives, such as chloro methyl styrene; A vinyl chloride, vinyl acetata, vinyl ester [, such as propionic-acid vinyl, ]:— unsaturated nitrile [, such as acrystoritrile ]; fineta)— a methyl acrystate — An ethyl acrystate, butyl acrystate (meta). (Berta) (meta) acrystate (meta). (Berta) Acrysic-caid stearyl, ethylene glycol (meta) acrystate, (meta) acrystate, perturbation propyl (meta) acrystate, and cyclohexyl (meta) acrystate, conjugated dienes, such as a butadiene and an isoprome, are mentioned.

[10031] It is not limited especially as the abover-mentioned reducibility radical content monomer and a copolymerizable cross-linking monomer, for example, a divrylbenzene, polyethylene GURIKORIUI (meta) acrystata, 1, 6-hexane dIORIUI (meta) acrystate, reopentyl GURIKORIUI (meta) acrystate, total-methylol METANTORI (meta) acrystate, total-methylol METANTORI (meta) acrystate, total-methylol METANTORI (meta) acrystate, its derivative, etc. are mentioned.

[0022] Moreover, it has a reacting point in the side chein of radical polymerization nature monomers, such as gamma-methacryloxyropyl trimethoxy silane, a particle may be made, and what gave sufficient dynamic reinforcement by the crosslinking reaction of a side-chain part may be used.

to used. (0003) The above-mentioned reducibility radical content monomer, the above and other monomers, and the above-mentioned cross-linking monomer may be used independently, and may use two or more sorts together. However, it is desirable to make the above-mentioned cross-linking monomer into 30% or more in [ all ] a monomer from a viewpoint of the reinforcement of the spacer for liquid crystal display components obtained.

(0034) It is not limited especially as a polymerization initiator used in case co (QU34) it is not limited especially as a polymerization initiator used in case copolymerization or the above-mentioned reducibility radical content monomer, and the above and other monomers and/or the above-mentioned cross-linking monomers is carried out. For example, a benzoyl peroxide, an orthochromatic chloro benzoyl peroxide, An orthochromatic methoxy benzoyl peroxide, and 5, 5-trimethythexanoyl peroxide, Organic peroxide, such as to butylperoxy2-witythexanoste and G t-butyl peroxide; azo system compounds, such as azobissobutyronitril azobis cyclohexa carbonitrile, and azobis (2,4-dimethylvaleronitrile), etc. are arobissobutyronitril, arobis cyclohesa carbonitrile, and arobis (2.4-dimethylvaleronitrile), etc. are mentioned. The amount of the above-mentioned polymerization initiator used usually has desirable 0.1 - 10 weight section to a total of 100 weight sections of a monomer. (0035) The above-mentioned reducibility radical content monomer, the above and other monomers, the above-mentioned cross-tinking monomer, and the above-mentioned polymerization initiator may also teach the whole quantity first, and after they teach a part, they may supply the remainder probably or continuously, in order to prevent the polymerization control by orygen on the occasion of a polymerization, inert gas, such as nitrogen, may permute the system of reaction, and it may be performed. Moreover, on the occasion of a polymerization, a distributed stabilizer can also be used if needed. As the above-mentioned distributed stabilizer, the surfacet of a metal-the precomberds proposition in processing of a polymerization. icity, or ionicity etc. can be suitably used into the surfactant of a metable macro

a medium.

(0018) As an approach using the above-mentioned macromolecule protective agent, the approach of introducing a reducibility radical into the front face of the particle obtained etc. is mentioned, for example by using the macromolecule protective agent which has a reducibility radical, in case the polymerization of the particle is carried out. As the above-mentioned macromolecule protective agent, especially if a reducibility radical is contained, it will not be limited, for example, water soluble polymers, such as polyvinyl alcohol, a polyvinyl alcohol derivative, a cellulous, calulouse scettate, starch, methyl cellulous, a carbonymethyl cellulous, hydroxyethyl cellulous, and the Pori (meta) acrylic acid (sodium salt), etc. are mentioned, hydroxyethyl cellulous, and the Pori (meta) acrylic acid (sodium salt), etc. are mentioned, closer reducibility radical into the front face of the particle obtained etc. is mentioned, for example by using the reactive surface active agent which has a reducibility radical, in case the polymerization of the particle is carried out. You may be macromolecule particles, such as not only the particle that is made to carry out the polymerization of the above reducibility radical content monomers, and is obtained as a particle which has the above-mentioned reducibility radical on a front face but benzoguanamino, nylon, polyester, protein, etc., and the particle which content monomers, and is obtained as a particle which has the above-mentioned reducibility radical on a front face but benzopusnamine, nylon, polyestor, protein, atc., and the particle which consists of an inorganic compound which has a raducibility radical on a front face.

[0038] The above-mentioned particle may be a coloring particle obtained for the improvement in contrast of a liquid crystal display component. What was not limited especially as the above-mentioned coloring particle, for example, a processed the above-mentioned particle with carbon black, a disperse dye, acid dye, basic dye, a metallic oxide, etc.; the film of the organic substance is made to form in the front face of the above-mentioned particle, and what was colored by making it decompose or carbonitz at an elevated temperature is mentioned. Moreover, when the quality of the material itself which forms the abover-mentioned coloring particle as it is, without coloring.

[0039] The method of carrying out the suspension polymerization of the constituent obtained by not being limited especially as the manufacture approach of the abover-mentioned coloring particle, for example, making the abover-mentioned recibility radical content monomer etc. distribute a pigment in an equosity medium to the bottom of existence of the abover-mentioned polymerization initiator etc. is mentioned.

[0040] It is not limited especially as a pigment used in case the abover-mentioned coloring.

polymerization initiator etc. is mentioned. [0040] it is not limited septicially as a gigment used in case the above-mentioned coloring particle is manufactured. For example, inorganic color pigments, such as carbon black, a graphite, iron black, chrome gren, cobait green, and chromic oxide: Brilliant carmine BS Lake carmine FB, brilliant fast scarlet, Lake Red 4R, Permanent Red R, the farce tread FGR, a tolaidine chastrut, Bis-azo yellow, the first yellow Q, a bis-azo orange, Balkan Pernisula Orange. Azo systems and condensation azo system organic color pigments, such as pyrazolone red: A copper phthalocyanine blue, farce toss — a turnip — color take organic color pigment; kino FUTARON

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Moreover, in addition to the above-mentioned hydroxyl group, epoxy groups, such as glycidyl (meta) acrylate, the monomer which has a carboxylic-acid radical etc. further are mentioned give reactivity to the shell layer of the spacer for liquid crystal display components obtained. These may be used independently and may use two or more sorts together. Moreover, these erization nature monomer and other copolymerizable polymerization nature monomers

be used together.

(0049) As an approach of making a polymerization layer forming in the above-mentioned particle front face, the particle which has the above-mentioned reducibility radical on a front face distributes in a solvent, for example, the above-mentioned polymerization nature monomer and

front tace, the particle which has the abover-mentioned reducibility radical on a front face distributes in a solvent, for example, the abover-mentioned polymerization nature monomer and the abover-mentioned cerium salt add to this, and the approach of carrying out a polymerization reaction etc. is mentioned to it by making the particle which has the abover-mentioned raducibility radical on a front face using the abover-mentioned cerium salt generate a radical, and making the abover-mentioned polymerization nesture monomer react further. [0050] Although especially the reaction temperature under abover-mentioned polymerization reaction is not limited, the stability of the complex of the abover-mentioned polymerization reaction is not limited, the stability of the complex of the abover-mentioned cerium salt to 0-90 degrees C are desirable. It is 10-50 degrees C are referably, Especially although not limited especially as a class of the abover-mentioned solvent, since the abover-mentioned cerium salt reacts with the alcohol which is a solvent and the reactivity changes especially with classes (1 and 2-glycol > the class [1st] > the class [2nd] > the 3rd class) of alcohol in using alcohol, it is suitable to use tertiary alcohol, such as t-butyl alcohol. [0051] in order [moreover.] to speed up the reaction rate of the polymerization system of reaction when a graft polymerization reaction cannot occur easily only with the abover-mentioned cerium salt for -being silker — an acid suitable in a polymerization system can be added and it can react in an acid range. It is not limited especially as the abover-mentioned acid, for example, a ritric acid, a suffuric acid, a hydrochloric acid formic acid, etc. are mentioned is it is more suitable for six or less plt to become desirable still lower as an acid range of the polymerization system of reaction. This is because dissociation of the abover-mentioned cerium salt stops being also to happen easily, when pH is high.

system of reaction. This is because dissociation of the above-mentioned cerium salt stops being able to happen easily, when pH is high. [0052] Moreover, further various reactions can be performed to the reaction possible part on the particle in which the polymerization layer obtained as mentioned above was formed. Although not limited especially as what is used for such a reaction, a compound with an isocynamic radical, the amino group, a carboxylic-soid radical, a carboxylate ghost, an epoxy group, a hydroxyl group.

etc. can be used, for exemple.

[0053] This invention 2 is a spacer for liquid crystal display components which r [UO3] This invention 2 is a spacer for inquio crysten display components when means a come to form a reactant graft polymerization layer in the above-mentioned particle front face, making an oxidizing agent react to the particle which has a reducibility radical on a front face, making the above-mentioned particle front face generate a radical, and making the polymerization nature monomer which has an epoxy group with this radical as the starting point react. [0054] The particle which has the reducibility radical used in this invention 2 on a front face is the same as that of the particle which has the reducibility radical explained in full detail in materials and this invention. I on a forest face.

the same as that of the particle which has the reducibility radical explained in full detail in explanation of this invention 1 on a front face. (0055) it is the same as that of the oxidizor explained in full detail in explanation of this invention 1 as an oxidizor used in this invention 2. (0056) it is exprised which is not finited especially as a polymerization nature monomer which has the epoxy group used in this invention 2, for example, contains glycidyl (meta) acrylate, the glycidyl allyl compound ether, and alcyclic epoxy functs) is mentioned. These may be used independently and may use two or more sorts together. (0057) Moreover, in addition to the polymerization nature monomer which has the above-mentioned epoxy group, copolymerization of the polymerization sature monomer which has the above-mentioned epoxy group, and the monomer of copolymerization which has the above-mentioned epoxy group, and the monomer of copolymerization esture may be carried out. It is not limited especially as the above and other monomers. For example, styrene, alban methy styrene, Styrene derivatives, such as p-methyl styrene, p-chloro styrene, and chloro methyl styrene, Vinyl scottate, vinyl ester [, such as propionic-necid vinyl, ]; — unsaturated nitrible [ such as scrylonithe]; [.meta] — a methyl scrylate — An ethyl scrylate butyl scrylate (meta), 2as acrylonitrile ]; (meta) — a methyl acrylate — An ethyl acrylate, butyl acrylate (meta), 2system organic color pigments, such as the phthalocyanine system organic color pigment; y lake [, such as a roux and Phthalocyanine Green, ], Lowe's lake, Wolet-Lake, blue lake, and Green lake, etc. are mentioned. These may be used independently and may use two or more

sorts together. [0041] The addition of the abo sorts together.

[0041] The addition of the above-mentioned pigment has the desirable 1 – 180 weight section to a total of 100 weight sections of the monomer used for manufacture of the above-mentioned coloring particle. If it is hard coming to color it a dark color in case of under 1 weight section and the 180 weight sections are exceeded, the mechanical strength of the particle obtained may not be obtained. It is the 3 – 180 weight section more preferably.

[0042] The approach which is not limited to the above-mentioned reducibility radical content moreomer data, especially as an approach of making homespecies of stributions the above-

monomer etc. especially as an approach of making homogeneity distributing the above-mentioned pigment, for example, uses a ball mill, a bead mill, a sand mill, attritor, a Sand grinder, a neno mizer, etc. is mentioned. [0043] In case the above-mentioned reducibility radical content monomer etc. is made to

a neno mizer, stc. is mentioned.

(0043) in case the abover-mentioned reducibility radical content monomer etc. is made to distribute the abover-mentioned pigment, a dispersant may be added in order to raise the dispersibility of the abover-mentioned pigment, it is not limited especially as the abover-mentioned pigment, it is not limited especially as the abover-mentioned dispersant, for example, water soluble polymer; barium sulfates, such as polyminy slochod, starch, methyl cellulose, a carboxymethyl cellulose, hydroxyethyl cellulose, and polymethacrylic acid sodium, a calcium sulfate, an aluminum sulfate, a calcium carbonate, cal polymethacrytic acid sodium, a calcium suthate, an abumnum suffate, a calcium carbonate, calcium phesphate, take, clay, the distorm earth, metallis-oxido powder, etc. are mentioned. The addition of the above-mentioned dispersant has desirable 0.01 = 20 weight section to a total of 100 weight sections of the monomer used for manufacture of the above-mentioned coloring particle. [0044] A polymerization layer is made to form in the above-mentioned particle front face in this investion 1 by making an exidizing agent react to the particle which has the above-mentioned reducibility radical on a front face, making the above-mentioned particle front face generate a radical, and making a polymerization nature monomer react with this radical as the starting point

[0045] It is possible to oridize the particle front face which has the above-mentioned reducibility radical on a front face as the above-mentioned oridizing agent, and to make a radical generate, especially that is not limited, for example, persulfate, a cerium salt, a hydrogen provide, dimethylamilie, sodium periodate, potassium permangerate, ally boron, etc. are mentioned. Moreover, in order to speed up the reaction rate of a polymerization system, acids and salts.

Moreover, in order to speed up the resction rate of a polymerization system, acids and satu, such as a nitrie acid, may be added.

[0048] 0,0001–20-moft of the concentration of the abover-mentioned oxidizer is desirable to the whole quantity of the monomer used for menufacture of the abover-mentioned particle. If the incidence rate of the radical which becomes being lass than [ 0,0001 mol \$ ] with a graft polymerization start point on a particle falls and 20-mol \$ is exceeded, a superfluous oxidizing agent will react with the radical which carried out end generating, will make a start point disappear, and will lessen a polymerization start point.

[0047] In this invention 1, a cerium salt is suitably used as the abover-mentioned oxidizer. As the abover-mentioned cerium salt, especially if it is tutravalence, it will not be limited, for example, and make a scale maintain a carrier (4) suither a mononium prophosphoric-good derium.

shove-mentioned carium salt, especially if it is tatravalence, it will not be limited, for example, cerium (4) sulfate, a cerium intrate, cerium (4) sulfate, a cerium intrate, cerium (4) sulfate ammonium, proprioposphoric-acid cerium ammonium, an iodation cerium, etc. will be mentioned. [0048] What is necessary is not to be limited but just to use what has the engine performance to give the spacer for figuid crystal display components obtained especially, as the above-mentioned polymerization nature monomer, if it is a radical polymerization nature monomer. For example, the monomer which has hydroxyl-tyroup; ethylene-glycol components, such as hydroxylatyl (meta) acrylate and methoxy polyethylene-glycol (meta) acrylate, is mentioned to give a hydrophilio property to the spacer for figuid crystal display components obtained. Moreover, the glycidy (meta) acrylate which has styrene derivative; reactive sites, such as fluorine content (meta) acrylate, styrene, such as alkyl (meta) acrylate, such as butyl acrylate (meta) acrylate, such as the problem styrene, an acrylic-acid (meta) stearyl, and pentafluoro propyl (meta) acrylate, and prehlero styrene, an acrylic-acid (meta), acrylamide (meta), etc. can be mentioned to give hydrophobicity to the spacer for figuid crystal display components obtained.

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ethylhexyl acrylate (meta). (Meta) Ethylene glycol (meta) acrylate, trifluoroethyl (meta) acrylate, Cyclohexyl (meta) acrylate, hydroxyethyl (meta) acrylate, Acrylic ester (meta) derivatives, such as hydroxypropyl (meta) acrylate, hydroxy butyl (meta) acrylate, gybrorol monochrome (meta) acrylate, acrylate, ethyl (meta) acrylate, etho. are mentioned. These may be used

scrylate, and GURISERINJI (Ineta) scrylate, etc. are mentioned. These may be used independently and may use two or more sorts together. [0058] Although it is not limited especially as reaction temperature of graft polymerization reaction time in case the above-mentioned reactant graft polymerization layer is made to form, the viewpoint of the viacosity of reaction time or a system to 30-100 degrees C are desirable. [0059] Moreover, eithough not limited especially as a solvent of graft polymerization reaction time, the mixed stock of the water independent from a soluble viewpoint of the above-mentionocoxidizer or water, and a polar organic solvent for example, other, dimethyl sufficials [, such as ketones methyl ether, ], such as alcohols; sectores, such as a methanol, ethenol, propanol, a butanol, and t-butyl alcohol, and a methyl ethyl ketone, dimethyl formamide, etc. are mentioned. These may be used independently and may use two or more sorts together.

butanol, and tr-butyl alcohol, and a methyl ethyl ketrone, dimethyliformamide, etc. are mentioned. These may be used independently and may use two or more sorts together. [0060] A graft polymerization layer does not exfoliate from a particle front face, and the spacer for Siguid crystal display components of this invention 2 has tho high adhesion over a substrate. Therefore, liquid crystal is not polluted and the liquid crystal display component which comes to use the spacer for fixeld crystal display components of this invention 2 does not have generating of the display nonuniformity by migration of a spacer etc. [0061] This invention 3 is a spacer for fixeld crystal display components characterized by making it come to form a reactant graft polymerization layer in said particle front face by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making said particle front face seperate a radical and makins the polymerization status nature monomer which has

particle front face generate a radical, and making the polymerization nature monomer which has the polymerization nature monomer and ethylene glycol radical which have an epoxy group with

the polymerization installs installed and polymerization and support and the starting point react.

[0062] The perticle which has the reducibility radical used in this invention 3 on a front face is the same as that of the perticle which has the reducibility radical explained in full detail in explanation of this invention 1 on a front face. The oxidizer used in this invention 3 is the same as the oxidizer explained in full detail in oxplanation of this invention 1.

[0063] The polymerization nature monomer which has the epoxy group used in this invention 3.

[0063] The polymerization nature monomer which has the epoxy group used in this invention 3 is the same as the polymerization nature monomer which has the epoxy group explained in full detail in explanation of this invention 2. As for the polymerization nature monomer which has the ethylene glycol radical used in this invention 3, polyethylene glycol monomethacrylate, methoxy polyethylene glycol monomethacrylate, polyethylene-glycol polyropylene glycol monomethacrylate, polyethylene-glycol polyropylene-glycol polyropylene-glycol monomethacrylate, polyethylene-glycol polyropylene-glycol monomethacrylate, polyethylene-glycol polyropylene-glycol monomethacrylate, polyethylene-glycol polyropylene-glycol monomethylene glycol monomethacrylate, tot. are mentioned. These may be used independently and may use two or more sorts together.

[0064] Moreover, in addition to the polymerization nature monomer which has the polymerization accopylenerization of the polymerization nature monomer which has the polymerization nature monomer and ethylene glycol radical which have the above-mentioned epoxy, and the monomer of copolymerizable others may be carried out. What was illustrated as the polymerization nature monomer which is not limited especially as the above and other monomers, for example, has repoxy in explanation of this invention 2, and a monomer of copolymerizable others, the same thing, etc. are mentioned.

thing, stc. are mentioned. [0005] Although it is not limited especially as reaction temperature of graft polymerization reaction time in case the above-mentioned reactant graft polymerization layer is made to form, the viewpoint of the viscosity of reaction time or a system to 30–100 degrees C are desirable. [0006] Moreover, although not limited especially as a solvent of graft polymerization reaction time, the mixed stock of the water independent from a soluble viewpoint of the above-mentione oxidizer or water, and a polar organic solvent is desirable. The same thing as the polar organic solvent which it was not limited especially as the above-mentioned polar organic solvent, for example, was illustrated in explanation of this invention 2 etc. mentions, and it is \*\*\*\*

[008]] A graft polymerization layer does not exfoliate from a particle front face, and the spacer for liquid crystal display components of this invention 3 has the high schesion over a substrate. Therefore, liquid crystal is not polluted and the liquid crystal display component which comes to use the spacer for liquid crystal display components of this invention 3 does not have generating of the display nonuniformity by migration of a spacer etc. [0088] This invention 4 is a spacer for liquid crystal display components which makes it come to form in the above-mentioned particle front face the graft polymerization layer which has a long-chain alkyl group by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making the above-mentioned particle front face generate a radical, and making the polymerization nature monomer which has a long-chain alkyl group with this radical as she starting point react.

as the starting point react. [0089] The particle which has the reducibility radical used in this invention 4 on a front face is (UUS) The particle which has the reducibility radical used in this invention 4 on a front face is the same as that of the particle which has the reducibility radical explained in full detail in explanation of this invention 1 on a front face. The oxidizer used in this invention 4 is the same as the oxidizer explained in full detail in explanation of this invention 1. (0070) Although not limited especially as a polymerization nature monomer which has the long—chain slityl group used in this invention 4, since it excels in the effectiveness of abnormality

chain allyl group used in this invention 4, since it excels in the effectiveness of abnormality conventions prevention, a with a carbon numbers of six or more thing is desirable, it is not limited especially as a polymerization nature monomer which has such a long-chain allyl group. For example, heryl (meta) scrylate, ortyl (meta) acrylate, iso octyl (meta) acrylate, 2-ethylheryl (meta) acrylate, Leuryl (meta) acrylate, isodecyl (meta) acrylate, Tridecyl (meta) acrylate, stearyl (meta) acrylate, beharyl (meta) acrylate, octyl (meta) acrylate, nonythenoxyethyl (meta) acrylate, lauryl polyoxyethylene (meta) acrylate, etc. are mentioned. These may be used independently and may use two or more sorts together.
[0071] Moreover, in addition to the polymerization nature monomer which has the abi

[0071] Moreover, in addition to the polymerization nature monomer which has the above-mentioned long-chain alkyl group, copolymerization of the polymerization nature monomer which has the above-mentioned long-chain skily group, and the monomer of copolymerizable others may be carried out. What was illustrated as the polymerization nature monomer which is not limited especially as the above and other monomers, for example, has epory in explanation of this invention 2, and a monomer of copolymerizable others, the same thing, etc. are mentioned. [0072] Although it is not limited especially as reaction temperature of graft polymerization along which has the above-mentioned long-chain askyl group is made to form, the viewpoint of the viscosity of reaction time or a system to 30–100 degrees C are desirable.

abyl group is made to form, the viewpoint of the viscosity of reaction time or a system to 30– 100 degress C are desirable.

[0073] moreover, although not limited especially as a solvent of graft polymerization reaction time, as a nonpolar solvent, from a soluble viewpoint of a polymerization nature monomer of having the abover-mentioned oxidizor and the abover-mentioned long-chain ablyl group A hexano, a heptane, an octane, benzene, tokene, etc. for example, as a polar solvent For example, water, a methanol, ethanol, propanol, i-propanol, Ether [, such as ketones; methyl ether ], such as alcohois; sectones, such as a butanol and tr-butyl slockol, and a methyl ethyl ketone; dimethyl sulfoxide, dimethylformamide, etc. are mentioned. These may be used independently and may use or more sorts together.

two or more sorts together.

[0074] This invention 5 is a spacer for liquid crystal display components which makes the graftpolymerization layer which has a functional group form in the above-mentioned particle front
face, and makes a long-chain altyl compound come further to reset to the graft-polymerization
layer which has a song-chain altyl compound come further to reset to the graft-polymerization
layer which has a reducibility radical on a front face, making the above-mentioned particle
front face generate a radical, and making the polymerization nature monomer which has a
functional group with this radical as the starting point reset.

[0075] The particle which has the reducibility radical used in this invention 5 on a front face is
the same as that of the particle which has the roducibility radical explained in full detail in
explanation of this invention 1 on a front face. The oxidizer used in this invention 5 is the same
as the oxidizer explained in full detail in explanation of this invention 1.

[0076] The polymerization nature monomer which is not limited especially as a polymerization

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explanation of this invention 1 on a front face. The exidizer used in this invention 6 is the same as the exidizer explained in full detail in explanation of this invention 1. [0083] The graft polymerization layer which has a functional group in this invention 6 is the same as the graft polymerization layer which has the functional group explained in full detail in

ation of this invention 5.

as the graft polymerization layer which has the functional group explanation of this invention 5.

[0084] In this invention 6, the active group which has a polymerization nature viryl group and/or polymerization initiation shiftly is introduced into the graft polymerization layer which has the above-mentioned functional group. The method of making the compound which has the functional group in which a reaction is possible, and a polymerization nature viryl group to the functional group of the graft polymerization layer which has the above-mentioned functional group react to the graft polymerization layer which has the above-mentioned functional group react to the graft polymerization layer which has the above-mentioned functional group react to the graft polymerization layer which has the above-mentioned functional group etc. is mentioned. It is not limited especially as such a compound, for example, exployer (meta) chloride, ecrytamide (meta) sprylate, etc. are mentioned functional group in which a reaction is possible to the functional group of the graft polymerization layer which has the above-mentioned functional group, for example as an approach of introducing the active group which has polymerization initiation shifty into the graft polymerization layer which has the above-mentioned functional group, an azo compound, etc. react to the graft polymerization layer which has the above-mentioned functional group as an approach of introducing the active group which has compound, for example, a 4 and 4-azobis-4-cyano-valence-acid. 2, and 2-azobis-2-(2-inidazolina) propane etc. is mentioned.

compound, for example, a name of the immediate proposed and proposed at the sective group and/or polymerization initiation shiftly which have the above—mentioned polymerization nature viving goup into the graft polymerization layer which has the above—mentioned functional group, the polymerization nature monomer which has an epoxy group is made to reset to it further in this invention 6 (0087) The polymerization nature monomer which has the epoxy group used in this invention 6 is the same as the polymerization nature monomer which has the epoxy group used in this invention 6 in the same as the polymerization nature monomer which has the epoxy group explained in full obtained in application of this invention 2.

[0088] Moreover, in addition to the polymerization nature monomer which has the al [0088] Moreover, in addition to the polymerization nature monomer which has the above-mentioned spony group, copolymerization of the polymerization nature monomer which has the above-mentioned epony group, and the monomer of copolymerization others may be carried out. What was illustrated as the polymerization nature monomer which is not limited especially as the above and other monomers, for example, has an epony group in explanation of this invention 2, and a monomer of copolymerizable others, the same thing, etc. are mentioned. [0099] A graft polymerization layer does not strollate from a particle front face, and the spacer for liquid crystal display components of this invention 8 has the high adhesion over a substrate. Therefore, fluid crystal is not polluted and the liquid crystal display component which comes to use the spacer for fluid crystal display components of this invention 6 does not have generating of the distrate non-informity be minimized or of a secsor when

use the spacer for fiquid crystal display components of this invention 6 does not have generating of the display nonuniformity by migration of a spacer etc. [1090] This invention? by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making the abover-mentioned particle front face generate a radical, and making the polymerization nature monomer which has a functional group is made to form in the abover-mentioned particle front face. Further By making the polymerization nature monomer which has a polymerization nature monomer which has a polymerization nature group which has a polymerization nature group which has a polymerization nature winy! group end/or polymerization initiation ability into the graft polymerization layer which has the abover-mentioned functional group it is the spacer for liquid crystal display components characterized by making it come to form the graft polymerization layer which has a long-chain alkyl group in the graft polymerization layer front face which has the solver-mentioned functional group.

[0091] The particle which has the reducibility radical used in this invention 7 on a front face is

nature monomer which has the functional group used in this invention 5, for example, has functional groups, such as a carboxyl group, a hydroxyl group, the amino group, an amide group an epoxy group, a suffore radical, a sufflyydryl group, and an isocyrante radical the viryl monomer which generates the above functional groups with means, such as hydrolysis, addition, condensation, and ring breakage, is mentioned. It is not finited especially as such a monomer, For example, an scryica exid (metal), 2-(meta) acryloylosystyl succinic exid, 2-(meta) acryloylosystyl phthasis exid, 2-hydroxystyl (metal) sucrylate, 2-(meta) acryloylosystyl phthasis exid, 2-hydroxystyl (metal) acrylate, A glycorol (meta) scrylate, Alleran extensions exid, 2-hydroxystyl (metal) acrylate, 2-(acryloylosymono)—An isobutane sufforis exid, scryloyl (metal) acrylate, Alyl alcohol, an isoonio exid, a crotonio exid, allyl glycidyl ether, dimethytaminoctypyl (metal) acrylate, Alyl alcohol, an isoonio exid, a crotonio exid, allyl glycidyl ether, dimethytaminoctypyl (metal) acrylate, alloyed, ether dimethytaminocrypyl (metal) acrylate, etc. are mentioned. These may be used independently and may use two or more sorts together. Moreover, in addition to the polymerization nature monomer which has the above-mentioned functional group, copolymerization of the polymerization nature monomer which has the above-mentioned functional group, copolymerization of the polymerization nature monomer which has the above-mentioned functional group, and the monomer of copolymerization nature monomer which has the above-mentioned functional group, and the monomer of copolymerization nature monomer which has the above-mentioned functional group, and the monomer of copolymerization nature monomer which has the above-mentioned functional group, and the monomer of copolymerization nature monomer which has the above-mentioned functional group, and the monomer of copolymerization nature monomer which has the above-mentioned functional group, and the monomer of copolymeriza er which has the functional group used in this invention 5, for example, has

others may be carried out.

(0077) Atthough it is not finited especially as reaction temperature of graft polymerization reaction time in case the graft polymerization layer which has the above-mentioned functiona group is made to form, the viewpoint of the viscosity of reaction time or a system to 30–100 s C are desirable.

orgrees to are desiration.

[0078] Moreover, although not limited especially as a solvent of graft polymerization reaction time, the mixed stock of the water independent from a soluble viewpoint of the above-mention oxidizer or water, and a polar organic solvent is desirable. The same thing as the polar organic oint of the above-mentioned

ums, the mixed stock of the water independent from a soluble viewpoint of the above-mentione oxidizer or water, and a polar organic solvent is desirable. The same thing as the polar organic solvent which it was not limited especially as the above-mentioned polar organic solvent, for example, was illustrated in explanation of this invention 2 etc. is mentioned. (0079) The spacer for fixed crystal displays components of this invention 5 makes a long-chain alkyl compound come further to react to the graft polymerization layer which has the above-mentioned functional group. It is not limited especially as the above-mentioned long-chain alkyl compound, for example, the helogenide and its salt, long-chain alkyl stamine, long-chain alkyl inecthoxysilane, long-chain alkyl cloride, a long-chain alkyl stamine, long-chain alkyl sorganical, etc. etc. ere mentioned to a long-chain alkyl sufficience and its salt, long-chain alkyl sufficience and its salt, long-chain alkyl compound, 8-30 are desirable. These may be used independently and may use two or more sorts together. (0080) Although it charges with classes of long-chain alkyl compound, 8-30 are desirable. These may be used independently and may use two or more sorts together. (0080) Although it charges with classes of long-chain alkyl compound as an approach of making the above-mentioned long-chain alkyl compound reacting to the graft polymerization layer which has the solver-mentioned functional group, the approach of performing in organic solvents, such as a methyl styll ketone, a tetrahydrofram, tokenes, a sylene, and eithyl acception, etc. is mentioned, for example. Moreover, the catalyst of an acid, alkali, etc. can be used according to the need for a reaction.

[0081] This invention 8 by making an oxidizing agent react to the particle which has a reducibility

according to the need for a reaction.

[0081] This invention 6 by making an oxidizing agent react to the particle which has a reducibility radical on a front face, making the abover-mentioned particle front face generate a radical, and making the polymerization nature monomer which has a functional group with this radical as the starting point react. The graft polymerization layer which has a functional group is made to form in the abover-mentioned particle front face. Further By making the polymerization nature monomor which has an epoxy group react to it, after introducing the active group which has a polymerization institution shiftly into the graft polymerization institution shiftly into the graft polymerization institution shiftly into the graft polymerization layer which has the abover-mentioned functional group. It is the spacer for flouid crystal display components characterized by making it come to form the graft polymerization layer which has an epoxy group in the graft polymerization layer front face which has the abover-mentioned functional group.

[0082] The particle which has the reducibility radical used in this invention 6 on a front face is the same as that of the particle which has the reducibility radical explained in full detail in

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the same as that of the particle which has the reducibility radical explained in full detail in explanation of this invention 1 on a front face. The oxidizer used in this invention 7 is the same as the oxidizer explained in full detail in explanation of this invention 1. [092] The graft polymerization layer which has a functional group in this invention 7 is the same

orization layer which has the functional group explained in full detail in

as the graft polymerization layer which has the functional group explained in full detail in explanation of this invention 5.

[0933] In this invention 7, the active group which has a polymerization nature viryl group and/or polymerization institation ability is introduced into the graft polymerization layer which has the sover-mentioned functional group. The approach of introducing a polymerization rature viryl group into the graft polymerization layer which has the sover-mentioned functional group is the same as the approach explained in full detail in explanation of the spacer for figuid crystal display components of this invention 8.

[DOSAI The approach of prints during the active group which has notwerization initiation shifts.

same as the approach explained in full detail in explanation of the spacer for liquid crystal display components of this invention 6.

[0094] The approach of introducing the active group which has polymerization initiation ability into the graft polymerization layer which has the abover-mentioned functional group is the same as the approach explained in full detail in explanation of this invention 6.

[0095] After introducing the active group which has the active group and/or polymerization initiation ability which have the abover-mentioned polymerization nature viryl group into the graft polymerization layer which has the abover-mentioned functional group, the polymerization nature monomer which has a long-chain allyl group is made to react to it further in this invention 7.

[0096] The polymerization nature monomer which has the long-chain allyl group used in this invention 7 is the same as the polymerization nature monomer which has the long-chain allyl group, copplymerization reture monomer which has the slover-mentioned long-chain allyl group, copplymerization in the polymerization nature monomer which has the abover-mentioned long-chain allyl group, copplymerization in the polymerization nature monomer which is not imited especially as the above and other monomers, for example, has an epoxy group in explanation of the spacer for liquid crystal display components of this invention 2, and a monomer of copplymerization which the orientation film and a transparent electrode have been amonged this invention 8. The spacer for liquid crystal display components of this invention 1, the spacer for liquid crystal display components of this invention 1 in the spacer for liquid crystal display components of this invention 1.

been arranged this invention 8 The spacer for liquid crystal display components of this invention 2. The spacer for liquid crystal display components of this invention 2. The spacer for liquid crystal display components of this invention 4, the spacer for liquid crystal display components of this invention 4, the spacer for liquid crystal display components of this invention 5, the spacer for liquid crystal display component which counters through the spacer for liquid crystal display component which counters through the spacer for liquid crystal display components of this invention 7 and by which figuid crystal is enclosed between the above-mentioned glass substrates. As the above-mentioned figuid crystal display component, what was shown in drawing 1 is mentioned for example. drawing 1 is mentioned, for example.
[0099]

(0099)
[Example) Although an example is hung up over below and this invention is explained to it in more detail, this invention is not limited only to these examples.
[0100] The mixed liquor of the diviny/benzene 100 weight section and the benzoyl-peroxide 2 weight section was added to the 3% water-solution 800 weight section of example 1 (production of the perticle which has a reducibility radical on a front face) polyvinyl alcohol, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particle are mean-particle—diameter =8.0micrometer and CV value =5, and performed the next actuation by making this particle into a seed particle child.

=8.0merometer and GV value =3, and performed the next actuation by making this particle in seed particle child. (0101) (Production of the particle which has a polymerization layer) the seed particle child 5 weight section obtained by the separable flask by the ion-rexchange-water 250 weight section the methyl methacrylate 5 weight section, and the above-mentioned actuation — in addition. water 250 weight section. after making SONIXETA distribute enough, it agitated to homogeneity. Nitrogen gas was introduced into the system and churning was continued at 30 degrees C for 3 hours. The second cerium ammonium solution of nitric socie\*12.5 weight section of 0.1 mols / L adjusted in the 1-N nitric-socid water solution was added to this, and it reacted to it for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the searception with the 3-micrometer membrane filter. Ethanol and an acotions washed this particle anough, and the susface component analysis of the dynamics reinforcement of a spacer were performed by the following approach using this particle. I result — dynamics reinforcement (10% K value) — 420kg/mm2 k; is — Methyl methacopytate existed in the spacer front face as a result of TOF-SIMS analysis.

[0103] (Evaluation of dynamics reinforcement) the particle obtained using the minute compression test machine (PCT-200, Shimadru Corp. make) by the cylinder smooth and face with a diameter [ made from a diamond ] of 50 micrometers — 0.21g (/second ] compression velocity and the maximum trial — too heavy — the compression test was performed by 10g and K value was calculated from the following formula.

R-1[ K = (3/root2) and F-S-3/2 and ]/2F: The too heavy value in 10% compressions set of a particle (bg)

S: the compression in 10% compression set of a particle — a variation rate (mm)

3. the conferession in 10s compession set or a particle of the procession of the particle of t

is detected in the area section of 0.2-micrometer angle is computable.

[0105] The same actuation as an example I was performed except having used the laurylacrylate 8 weight section for composition of the particle which has an example 2 polymerization layer instead of methyl methacrylate as a polymerization nature monomer. The spacer was evaluated using this particle, a result — dynamics reinforcement (10% K value) — 420kg/mm2 it is — laurylacrylate existed in the spacer front face as a result of TOF-SIMS analysis.

[0106] The same actuation as an example I was performed except having used the hydroxy methacrylate 5 weight section for composition of the particle which has an example 3 polymerization layer instead of methyl methacrylate as a polymerization rature monomer. Hydroxyethyl methacrylate existed in the spacer front face as a result of TOF-SIMS analysis.

[0107] Furthermore, the particle 2 weight section and the toluene 30 weight section which were obtained here were stirred at 80 degrees C in the spacerable flask, and the Dipbouti rutin JIRAURI rate 0.04 weight section was dissolved in this at the toluene 4 weight section, and it added. The proxyl isocysnate 5 weight section was dissolved in this at the toluene 5 weight section, and it added, and reacted at 80 degrees C for 8 hours, Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. The sections washed this particle enough and the vacuum dryer performed reduced pressure drying.

performed reduced pressure dyving.
[0108] The spacer was evaluated using this particle, a result — dynamics reinforcement (10%
value) — 420xf/rmn2 it is — the propyl group existed in the spacer front face as a result of

value) — 420kg/mm² it is — the propyl group existed in the spacer front face as a result of TOF-SIMS analysis.

TOF-SIMS analysis.

[0109] The example 4 tetramethylokmethane-triscrylate 60 weight section, the diviny/bonzene 20 weight section, and the acrylonitrile 20 weight section was mixed to homogeneity, the carbon blach 12 weight section was added to this, and homogeneity was made to distribute carbon black over 48 hours using a bead mill. The benzoyf-peracide 2 weight section was mixed into this monomor mixture at homogeneity, and this was further supplied to the 3% water-solution 850 weight section of polyvinyl alcohol. After agitating well and performing grain refining, the temperature up was carried out to 80 degrees C under the retrogen air current, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles are mean-particle—

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[0118] It replaced with example 7 polyvinyl alcohol, and the seed particle child was produced like

[0118] It reptaced with example 7 polyvinyl alcohol, and the seed particle child was produced like the example 1 using hydroxysthyl cellulose, and the particle which has a polymerization layer like [ it is the same and ] an example 1 continuously was produced. The spacer was evaluated using this particle, a result — dynamics reinforcement (10% K value) — 420kg/r/mn2 it is — methyl methacrylate existed in the spacer front face as a result of TOF-SIMS enalysis. [0119] The mixed idjuor of the divinylbearcen 100 weight section and the benzoyl-peroxide 2 weight section was added to the 3% water-solution 800 weight section of example 8 (production of the particle which has a reducibility radical on a front face) polyvinyl alcohol, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 50 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter -6,0micrometer and CV value =5. When surface analysis was performed in TOF-SIMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child. [0120] (Formation of a reactant graft polymerization layer) After adding the seed particle child 5 weight section, obtained by the ion-exchange-water 95 weight section, the glycidyl methacrylate 5 weight section, the methyl methacrylate 5 weight section, and the above-mentioned actuation to the separable flask and distributing it enough by SONIKETA, it agitated to homogeneity. Nitrogen gas was introduced into the system and chuming was continued at 30 degrees C for 3 hours. The second cerium ammonium solution of nitric acid 10 weight section mixture was taken out after reaction termination and reaction mixture was taken out after reaction termination and reaction mixture was

ed out to the particle the 🗪 exception with the 3-micrometer membrane filter. Ethanol and

carried out to the particle the \*\* exception with the 3-micrometer membrane filter. Ethanol and an acetone washed this particle enough, and the vacuum dryer performed reduced pressure drying. About the obtained particle, the elution test and the adhesive evaluation to Riguid crystal were performed by the following approach. The result was shown in Table 1. [0122] (Ethion test to liquid crystal) (ag of obtained particles was distributed to liquid crystal (Merch [ Co. ] make: ZLI-4720-000) 2mL, and it was left at 80 degrees C for 200 hours. Then, liquid crystal was collected and the gas chromatography investigated the purity of figuid crystal. [0123] (Adhesion test) it sprinkled to the glass substrate (the Nissan chemistry company make: SANEBA 150 230 degree-Cx 1-hour baking behind a spin cost) which the polyimide orientation flam was applied [ glass substrate] and stiffered the obtained particle. After heating this substrate on the temperature conditions of 150 degree-Cx 1 hour for 120 degree-Cx 10 minutes, the air blow trial was cernical out by sprying air for 5 seconds from the distance of 10cm from a substrate from an air gun (3 kg/cm2), and remeasuring the number of the particle which remained, after measuring the particle number within a predetermined visual field with an optical microscope. [0124] The same actuation as a exemple 9 (production of the particle which has a reducibility redical on a front face) example 8 was performed.

[0124] The same actuation as example 9 (pr radical on a front face) example 8 was perfo

(Formation of a reactant graft polymerization layer) The same actuation as an example 8 wa

(Formation of a reactuart graft polymerization layer) The same actuation as an example 8 was performed except having used hydroxyethyl methacrylate instead of methyl methacrylate. About the obtained particle, the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 1. [0125] The same actuation as example 10 (production of the particle which has a reducibility radical on a front face) example 8 was performed. (Formation of a reactuant graft polymerization layer) The same actuation as an example 8 was performed except having used the glycidyl skyl compound other instead of glycidyl methacrylate, and having used hydroxyethyl methacrylate instead of methyl methacrylate. About the obtained particle, the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 1. [0128] The same actuation as example 11 (production of the particle which has a reducibility radical on a front face) example 8 was performed.

radical on a front face) example 8 was performed.

[0127] (Formation of a reactant graft polymerization layer) After adding the seed particle child 5

diameter =8.0micrometer and CV value =5, and performed production actuation of the particle which has a polymerization layer like an example 1 by making this particle into a seed particle

child.
[0110] The spacer was evaluated using this particle, a result — dynamics rainf value) — 420kgf/mr TOF-SIMS analysis. - 420kgf/mm2 it is -- methyl methacrylate existed in the spacer front face as a result of

TOF-SMS analysis.

[0111] The mixed Squor of the divery/benzane 80 weight section, the hydroxyethyl methacrylate
20 weight section, and the benzoyl-peroxide 2 weight section was added to the example 5
surface-active-agent high tenor's N-08 (Dai-loh Kogyo Seiyaku Co., Ltd. make) 3% watersolution 800 weight section, it agitated with the homogenizor, and grain refining was performed.

The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating
after that, and the reaction was performed for 15 hours. Thermion archange water and a
methanol performed classification actuation for the obtained perticle after washing. The obtained
perticles are mean-perticle-diameter =8.0micrometer and CV value =5, and performed production
actuation of the perticle which has a polymerization byer tike an example 2 by making this
particle into a seed particle child.

particle into a seed particle child.

[0112] The spacer was evaluated using this particle, a result — dynamics reinforcement (10% K value) — 400kg/mm2 it is — tourybacrylate existed in the spacer front face as a result of TOF-

SIMS analysis.

[0113] The seed particle child 5 weight section obtained in the 10% hydrogen-peroxide-solution

60 weight section, the sectione 70 weight section, and the example 1 was put into example 6

separable flash, and it stirred for 30 minutes, and the methyl methacrylate 5 weight section and

the incrn-staffer 7 hydrate 20 weight section were sedded to this, and it stirred at 50 degrees C

for 3 hours. Resotion minture was taken out after reaction termination and reaction mixture was

carried out to the particle the sex exception with the 3-micrometer membrane filter. Ethanol and

an acctone washed this particle enough, and the vacuum driver performed reduced pressure

driving.

an sectors washed via particle enough, and the vacuum cryer performed veduced praison drying.

[0.114] The spacer was evaluated using this particle, a result — dynamics reinforcement (10% K vake)— 420kg/mm2 it is — methyl methacrylate existed in the spacer front face as a result of TOF-SMS analysis.

[0.115] it replaced with example of comparison 1 polyvinyl elochol, and the seed particle child was produced using the surfactant high tenor N-08 (Dai-Ichi Kogyo Seiyaku Co., Ltd. make), and the particle which has a polymerization layer like an example 1 continuously was produced. The spacer was evaluated using this particle, a result — dynamics reinforcement (10% k vake)— 420kg/mm2 it is — the divinylbenzene existed in the spacer front face as a result of TOF-SIMS analysis, and existence of methyl methacrylate was not able to be checked.

[0.118] After adding the seed particle child 5 weight section obtained in the ion-exchange-water 200 weight section, the methyl methacrylate 5 weight section, and the example 1 to example of comparison 2 separable flash and distributing it enough by SONIKETA, it agisted to homogeneity. Nitrogen gas was introduced into the system and churning was continued at 30 degrees C for 3 hours. Benchyl-provided of 1, weight section addition was carried out, and it reacted to this for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out, and it reacted to this for 5 hours. An an action washed this perticle cnough, and the vacuum dryer

membrane filter. Ebanol and an acottone washed this particle enough, and the vacuum dryer performed reduced pressure drying. The spacer was evaluated using this particle, a result — dynamics reinforcement (10% K value) — 42mg/mm/2 it is — the diviny/borzene existed in the spacer front face as a result of TOF-SIMS analysis, and existence of methyl methacrylate was

spacer front face as a result of TOF-SMS analysis, and existence of methyl methacrylate was not able to be checked.

[0117] The same actuation as an example 1 was performed except having used the divinybenzene 20 weight section and the burylacrylate 80 weight section for composition of the perticle which has an example of comparison 3 reducibitly radical on a front face. The spacer was evaluated using this particle. And the obtained particle was very weak and dynamics reinforcement (10% K value) was not able to be measured. Laurylacrylate and a divinythenzene axisted in the spacer front face as a result of TOF-SMS analysis.

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weight section obtained by the ion-exchange-water 100 weight section, the isopropyl alcohol 30 weight section, the plycibyl methacrylate 45 weight section, and the above-mentioned actuation to the separable flash and distributing it enough by SOMIKETA. It agitated to homogeneity. Furthermore, it stirred by adding the ammonium persuffate 0.15 weight section and the sodium-hydrogensulfite 0.003 weight section, and making it fully dissolve. The system was once decompressed with the pump, nitrogen gas was introduced after that, and attirring was continued for 30 minutes. The temperature up of this was carried out to 50 degrees C, and the reaction was continued for 2 hours. The system was cooled 2 hours after, the tetrahydrofuran 100 weight section and fittle hydroquinone were added, and the reaction was stopped. [0128] Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\*exception with the 3-micrometer membrane filter. This particle was enough washed in the tetrahydrofuran and the vacuum dryer performed reduced pressure drying. About the obtained particle, the elution test and the adhesive evaluation to liquid crystal were performed filts the example 8. The result was shown in Table 1. [0129] The example 12 (production of particle which has reducibility radical on front face) trimethylobropane-triscrytate 50 weight section, the divinybenzene 40 weight section, and the scryloritize IO weight section were mixed to homogeneity, the carbon black 12 weight section, and the scryloritize IO weight section were mixed to homogeneity, the carbon black 12 weight section, and the scryloritize IO weight section were mixed to homogeneity, the carbon black 12 weight section, and the scryloritize IO weight section were mixed to homogeneity, the carbon black 12 weight section, and the scryloritize IO weight section were mixed to homogeneity, the carbon head of the striving enough and performing grain refining under the nitrogen air current, the temperature up was furth

particle child.
[0130] (Formation of a reactant graft polymerization layer) The same actuation as an example 8 was performed. About the obtained particle, the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 1.
[0131] The mixed liquor of the divinythenzene 80 weight section, the hydroxyethyl methacrylate 20 weight section, and the benzoyth-peroxide 2 weight section was added to the example 13 (production of particle which has reducibility radical on front face) surface—active-agent high (production of particle which has reducibility radical on front face) surface-active-agent high tenor's N-08 (Dai-Ichi Kogyo Seiyaku Co., Ltd. make) 3% water-solution 800 weight section, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Not water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter =8.0 micrometer and CV value =5.0. When surface arealysis was performed in TOF-SIMS, the OH radical of the hydrosysthyl methacrylate origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

sctustion was performed by making this particle into a seed particle child.

[0132] (Formation of a reactant graft polymerization layer) The same actuation as an example 8 was performed. About the obtained particle, the shation test and the softesive evaluation to fiquid crystal were performed like the example 8. The result was shown in Table 1.

[0133] The mixed liquor of the divimplementers 100 weight section and the benzoyl-peroxide 2 weight section was added to the 3% water-solution 800 weight section of example of comparison 4 polyminy slochol, it againste with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were meam-particle-diameter =8.0micrometer and CV value =5.0. About the obtained particles, the elution test and the scheiner evaluation to fiquid crystal were performed file the example 8. The result was shown in Table 1.

[0134] 80 get particles obtained in the example 4 of example of comparison 5 comparison was

[0134] 80s of particles obtained in the example 4 of example of comparison 5 comparison was

methocylate copolymerization particles was made to stick to them. This was made to cover heat treatment and the particle which has a reaction layer was compounded. About the obtain particle, the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 1.

[0135]

Table 11

|              | M品格由政策<br>打対による以及の発度(X) | 179- 祝養性<br>179- 祝養性養 (%) |
|--------------|-------------------------|---------------------------|
| <b>英華何</b> 多 | 100                     | 90                        |
| 双旋床 9        | 100                     | 9.6                       |
| RED I G      | 100                     |                           |
| 家庭用りょ        | 100                     | 9.8                       |
| 万里州12        | 100                     | 9.0                       |
| 東株円13        | 100                     | 8.8                       |
| 比較例4         | 100                     | 3 5                       |
| 比較何 5        | 99. 5                   | 90                        |

[0138] The mixed liquor of the diviny/benzene 100 weight section and the benzoyt-peroxide 2 weight section was added to the 3% water-solution 800 weight section of example 14 (production of the particle which has a reducibility redical on a front face) polyvinyl alcohol, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were marr-particle-diameter =8.0micrometer and CV value =5. When surface analysis was performed in TOF-SIMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

[0137] (Formation of a reacturit graft polymerization layer) the seed particle child 5 weight section, the section obtained by the separable flask by the ion-racthange-water 59 weight section, the phycicyl methacrylata 5 weight section, the methoxy polyethylene-glycol mono-methacrylate (rumber of ethylene glycol units = 9) (Higpon OB & Fats maker MA- 400) 5 weight section, and the above-mentioned actuation — in addition, after making SOMIXETA distribute enough, it agitated to homogeneity. Nitrogen gas was introduced into the system and churning was continued at 30 degrees C for 3 hours. The second cerum ammonium solution of nitric acid 10 weight section of 0.1 mol/L was added to this, and it reacted to it for 5 hours.

[0138] Reaction mixture was taken out after reaction termination and reaction mixture was carried out the obtained particle, dynamics reinforcement membrane filter. Ethanol and an actione washed this particle enough, and the vacuum dryer performed reduced pressure carried out the obtained particle, dynamics reinforcement membrane filter. Ethanol and an actione washed this particle enough, and the vacuum dryer per

example 8. The result was shown in Table 2. 
[0139] The same actuation as example 15 (production of the particle which has a reducibility radical on a front face) example 14 was performed. 
[0140] (Formation of a reactant graft polymerization layer) The same actuation as an example 14 was performed except having used methosy polyethylene-glycol mono-methacrylate (the number of ethylene glycol units = 9) (thoppen 03 & Fats make-MA- 4000) instead of methoxy polyethylene-glycol mono-methacrylate (the number of ethylene glycol units = 9) (thippen 03 & Fats make-MA- 400). About the obtained particle, dynamics reinforcement was evaluated like the example 1, and the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 2.

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ctuation was performed by making this particle into a seed particle child. (0149) (Formation of a reactant graft polymerization layer) The same actuation as an example 14 was performed. About the obtained particle, dynamics reinforcement was avaluated like the example 1, and the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 2. [0150] The mixed liquor of the diviny/benzene 100 weight section and the benzoyl-

(D150) The mixed liquor of the diverybenzene 100 weight section and the benzoyl-peroxide 2 weight section was added to the 3% water-solution 800 weight section of example of comparison 6 polyvinyl alcohol, it agistated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter =8.0micrometer and CV value =5.0. About the obtained particles were mean-particle-diameter =8.0micrometer and CV value =5.0. About the obtained particle, ohyamics reinforcement was evaluated like the example 1, and the elution test and the adhesive evaluation to liquid crystal were performed like the example 1. The result was shown in Table 2. (0151) 80g of particles obtained in the example 6 of example of comparison 7 comparison was mixed in the alcoholic solvent, and 8g of 0.2-micrometer methoxy polyethylenerglycol monomethocrylate fournier of united solvents; = 9) (Nippon 01 & Fatte make-MA- 400)-glycicyl methocrylate copolymerization particles was made to stick to them. This was made to cover with heat treatment and the particle which has a reaction layer was compounded. About the obtained particle, dynamics reinforcement was evaluated like the example 1, and the elution test and the adhesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 2.

Table 2.

[0152] The mixed liquor of the glycidyl methacrylate 50 weight section, the methoxy polysthylene-glycol mono-methacrylate (number of ethylene glycol units = 9) (Nispon Oil & Fats make-MAA - 400) 50 weight section, and the benzoyl-peroxide 2 weight section was added to the example of comparison 8 surfactant high tenor's N-O8 (Dain-Ichi Kogyo Selyaku Co., Ltd. make) 33 water-solution 800 weight section, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle after washing. The obtained perticles were mear-particle-diameter =60 micrometer and CV value =50.0 About the obtained particle. memics reinforcement was evaluated like the example 1, and the elution test and the adhesiv relustion to liquid crystal were performed like the example 8. The result was shown in Table 2. Table 21

|               | 力學強度<br>(K 1 0 能) | 統品修出試験<br>介別による機品の<br>観式(%) | 付着性<br>以か・試験<br>見留率 (X) |
|---------------|-------------------|-----------------------------|-------------------------|
| <b>実施州14</b>  | 450               | 100                         | 9.0                     |
| 実施例15         | 450               | 100                         | 71                      |
| 果脏例16         | 450               | 100                         | 8.5                     |
| 実施例17         | 450               | 100                         | 90                      |
| <b>東施州1</b> 0 | 450               | 100                         | 93                      |
| 突旋列19         | 450               | 100                         | 90                      |
| 比较何6          | 450               | 100                         | 3.5                     |
| 比較例7          | 450               | 99. 5                       | 90                      |
| 注偿何 8         | 別名かに名物            | 100                         | 50                      |

[0154] The mixed liquor of the diviny/benzene 100 weight section and the benzoyl-peroxide weight section was added to the 3% water-solution 800 weight section of example 20 (produ of the particle which has a reducibility radical) polyvinyl alcohol, it agisted with the homogeneous control of the particle which has a reducibility radical) polyvinyl alcohol, it agisted with the homogeneous control of the particle which has a reducibility radical) polyvinyl alcohol.

[0141] The same actuation as example 16 (production of the particle which has a reducibility radical on a front face) example 14 was performed.
[0142] (Formation of a reactant graft polymerization tayer) The same actuation as an example 14 was performed except having used the glyciclyl allyl compound other instead of glyciclyl methecrylate. About the obtained particle, dynamics reinforcement was evaluated like the example 1, and the elation tests and the adhesive evaluation to figuid crystal were performed like the example 8. The result was shown in Table 2.
[0143] The same actuation as example 17 (production of the particle which has a reducibility radical on a front face) example 14 was performed.
[0144] (Formation of a reacted erraft power) the sand particle child 5 weight

(0143) The same actuation as example 17 (production of the particle which has a reducibility radical on a front face) example 14 was performed.
(0144) (Formation of a reactuant graft polymerization layer) the seed particle child 5 weight section obtained by the separable flash by the ion-suchange-water 100 weight section, the inspropry alcohol 30 weight section, the glycidyl methercytate 40 weight section, the methory polyethylener glycol units = 9) (Nippon 0il 8. Fats make-MA- 400) 10 weight section, and the above-mentioned schartion — in addition, after making SOMRETA distribute enough, it signated to homogeneity. Furthermore, it strined by adding the ammonium persulfate 0.15 weight section and the addium-hydrogensulfite 0.003 weight section, and making it fully dissolve. The system was once decompressed with the pump, nitrogen gas was introduced after that, and stirring was continued for 30 minutes. The temperature up of this was carried out to 50 degrees C, and the reaction was continued for 2 hours. The system was cooled 2 hours after, the tetrahydrofuran 100 weight section and fittle hydrogiamone were added, and the reaction was stopped.
(0145) Reaction mixture was taken out after reaction termination and reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle of the exception with the 3-micrometer membrane filter. This particle was enough washed in the tetrahydrofuran and the vacuum dryer performed reduced pressure drying. About the obtained particle, dynamics reinforcement was evaluated like the example 8. The result was shown in Table 2.
(0146) The example 8. The result was shown in Table 2.
(0146) The example 18 (production of particle which has reducibility radical on front face) trimethylopropane-trisorylate 50 weight section, the divinybenzene 40 weight section, and the actypionitie 10 weight section were mixed to homogeneity, the carbon black 12 weight section was active to this, and stirring was performed for 48 hours using the bead mill. The

perticle child.

[0147] (Formation of a reactant graft polymerization layer) The same actuation as an example 14 was performed. About the obtained perticle, dynamics reinforcement was evaluated like the example 1, and the elation test and the schesive evaluation to liquid crystal were performed like the example 8. The result was shown in Table 2.

[0148] The mixed liquor of the diviny/benzene 80 weight section, the hydroxyethyl methacrylate 20 weight section, and the benzoyl-peroxide 2 weight section, was added to the example 19 chroduction of particle which has reducibility radical on front face) surface-setive-gent high tenor's N-08 (Dairlehi Kogyo Seiyaku Co., Ltd. make) 3% water-solution 800 weight section, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Hot water and a methenol performed classification actuation for the obtained perticle after washing. The obtained perticles were mean-rearticle-disanted obtained particle after washing. The obtained particles were mear-particle-diameter =8.0micrometer and CV value =5.0. When surface analysis was performed in TOF-SIMS, the OH radical of the hydroxyethyl methacrylate origin was checked on the front face. The next

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and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mem-raparticle-diameter = 60 micrometer and CV value = 5. When surface analysis was performed in TOF-SIMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making

seed particle child.

[0153] (Formation of the graft polymerization layer which has a long-chain alkyl group) the seed particle child 5 weight section obtained by the separable flash by the ion-exchange-water 95 weight section, the lawylaterylate 10 weight section, and the above-mentioned schatton — in addition, after making SONIXETA distribute enough, it agitated to homogeneity. Nitrogen gas was introduced into the system and churning was continued at 30 degrees C for 3 hours. The second cerium erronoisum solution of nitric soid 10 weight section of 0.1 mobs / L adjusted in the 1-N nitric-soid water solution was added to this, and it reacted to it for 5 hours.

[0156] Reaction mixture was taken out after resettion termination and reaction mixture was carried out to the particle the exception with the 3-micrometer membrane filter. Ethanol and an section washed this particle enough, and the vacuum dryer performed reduced pressure drying. About the obtained particle, dynamics reinforcement was evaluated like the example 1, and the orientation condition was evaluated by the following approach. The result was shown in Table 3.

[9057] (Evaluation of an orientation condition) The obtained particle was aprinted, the substrate size [ of 50x50mm ] and cel gap 6.0micrometer STN mold liquid crystal display was produced, it is the following, and the orientation condition of liquid crystal was made and evaluated. The

size [ of 50x50mm] and cel gap 8 0micrometer STN mold liquid crystal display was produced, it is the following, and the orientation condition of fiquid crystal was made and evaluated. The observation comparison of the initial state (condition impressed to equipment AC3V after cel production) and electrical-potential-difference impression condition (condition which impressed the electrical potential difference of 400Hz and AC50V for 5 seconds, and impressed it to equipment AC3V after that) of a liquid crystal display was carried out with the polarization microscope, and when it shone around a particle and an omission occurred after electrical-potential-difference impression, it was estimated as abnormality orientation generating. [0158] The same actuation as example 21 (production of the particle which has a reducibility radical on a front face) example 20 was performed.

(Formation of the graft polymerization layer which has a long-chain alkyl group) The same actuation as an example 20 was performed except having used octyl methocytate instead of laurylacrylate. It evaluated about dynamics reinforcement and an orientation condition as well as [particle / which was obtained] an example 2.0 The result was shown in Table 3.

[0159] The same actuation as example 22 (production of the particle which has a reducibility radical on a front face) example 20 was performed.

[0160] Gromation of the graft polymerization happy which has a long-chain alkyl group) the seed particle child 5 weight section obtained by the separable flash by the ion-exchange-water 50 weight section, the isopropyl alcohol 80 weight section, the stearyl methocytated 54 weight distribute emough it agistated to homogeneity. Furthermore, its time by adding the ammonium persulfate 0.15 weight section and the addium-hydrogenesulfite 0.003 weight section, and making it fully dissolve. The system was conce decompressed with the pump, nitrogen gas was introduced after, the tetrahydrofuram 100 weight section and fittle hydroquinone were added, and the reac

stopped.
[0181] Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. This particle was enough washed in the tetrahydrofuran and the vacuum dryer performed reduced pressure drying, it evaluated about dynamics reinforcement and an orientation condition as well as [particle / which was obtained] an example 20. The result was shown in Table 3.
[0182] The example 23 (production of particle which has reducibility radical on front face)

sane-triscrylate 50 weight section, the diviny/benzene 40 weight section trimethylobropane-triscrylate 50 weight section, the divinybanzene 40 weight section, and the acrylonizhie I0 weight section were mixed to homegeneity, the carbon black 12 weight section was added to this, and stirring was performed for 48 hours using the bead mill. The benzoyl-perazide 2 weight section was mixed into this monomer mixture at homogeneity, and this was further supplied to the 33 wester-solution 550 weight section of polyvinyl alcohol. After stirring enough and performing grain refining, under the nitrogen air current, the temperature up was carried out to 80 degrees C, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter =6 0micrometer and CV value =5.0, and were black. When surface enablysis was performed in TOF-SDMS, the OH racked of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle chair. rticle child.

[0163] (Formation of the graft polymerization layer which has a long-chain alkyl group) The same actuation as an example 20 was performed. It evaluated about dynamics reinforcement and an orientation condition as well as [particle / which was obtained] an example 20. The result was shown in Table 3.

shown in 1906 3. [0164] The mixed liquor of the diviny/benzene 80 weight section, the hydroxyethyl methacrylat 20 weight section, and the benzoyl-peroxide 2 weight section was added to the example 24 (production of particle which has reducibility radical on front face) surface-sective-agent high tenor's N-08 (Dai-Ichi Kogyo Serjaku Co., Ltd. make) 3% water-solution 800 weight section, it agitated with the homogenizor, and grain refining was performed. The temperature up was carr out to 80 depress C under the nitrogen air current, agitting after that, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the performed for 15 hours. Not water and a methanol performed classification actuation for the obtained particles were mass-particle-disenserticle—disenser =8 0 micrometer and CV value =3.0. When surface analysis was performed in TOF-SIMS, the OH radical of the hydroxyethyl methacrylate origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

[0185] [Formation of the graft polymerization layer which has a long-chain alkyl group) The same actuation as an example 20 was performed. It evaluated about dynamics reinforcement and an orientation condition as well as { particle / which was obtained } an example 20. The result was shown in Table 3.

[0166] The mixed liquor of the diviny/benzene 100 weight section and the benzoyl-peroxide 2 [0188] The mixed liquor of the diviry/benzene 100 weight section and the benzoy/speroxide 2 weight section was added to the 35 water-polation 800 weight section of example of comparison 9 polyvinyl sloohol, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating attack, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particles after washing. The obtained particles were mean-particle-dismeter-80-micrometer and CV value 5.1 to evaluated about dynamics reinforcement and an orientation condition as well as [ particle / which was obtained ] an example 20. The result was shown in Table 3.

[0187] The mixed liquor of the diviry/benzene 20 weight section, the stearyl methacrylate 80

[0167] The mixed liquor of the diviny/benzene 20 weight section, the stearyl methacrylate 80 weight section, and the benzoyf-peroxide 2 weight section was added to the example of comparison 10 surfacer-scrive-agent high tenor's N-08 (Dai-lehi Kogyo Selyaku Co., Ltd. make) 35 water-solution 800 weight section, it stirred with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification scutation for the obtained particle after washing. The obtained particle after washing. The obtained particle sever mean-particle-diameter =6.0micrometer and CV value =5. At evaluated about dynamics reinforcement and an orientation condition as well as [ particle / which was obtained ] an example 20. The result was shown in Table 3.

[0168] The same actuation as example of comparison 11 (production of the particle which has a reducibility radical on a front face) example 20 was performed.

(Formation of a graft polymerization layer) The same actuation as an example 20 was performed except having used the methyl methacrylate 10 weight section instead of laurylacrylate. It

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an example 25 was performed.

[0175] (Reaction of a long-chain alkyl compound) the particle 5 weight section obtained by the separable flask by the tetrahydro-liRAN 150 weight section, the triethydamine 20 weight section, and the above-mentioned actuation — in addition, after making SONIKETA distribute enough, it streed to homogeneity. Subsequently, the solution which melted the stearin acid chloride 10 weight section in the tetrahydrofuran 20 weight section was dropped at the system. The system was kept at 30 degrees C, it streed for 3 hours, and the reaction was continued.

[0176] Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\*e exception with the 3-micrometer membrane filter. The tetrahydrofuran and the methanol washed this particle enough, and the vacuum dryer performed reduced pressure drying. It evaluated about dynamics reinforcement and an orientation condition as well as [ particle / which was obtained 3 an example 25.

[0177] The same actuation as example 27 foroduction of the particle which has a reducibility radical on a front face) example 25 was performed.

(Formation of the graft polymerization layer which has a functional group.) The same actuation as an example 25 was performed except having used the methacrylic-acid 10 weight section obtained by the separable flast by the tokune 60 weight section, the triethylamine 1 weight section, and the above-mentioned actuation — in addition, after making SONIKETA distribute enough it street to homogeneity. Subsequently, the solution which method the steary legicity 10 weight section in the tokuene 10 weight section was dropped at the system. The system was stirred under reflux representative for 6 hours and the section was dropped at the system. The system was stirred under reflux representative for 6 hours and the section was dropped at the system.

to homogeneity. Subsequently, the solution which melted the stearyl plycidy! 10 weight section in the tokene IO weight section was dropped at the system. The system was stirred under reflux temperature for 6 hours, and the reaction was continued.
[0179] Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. Tokene and a methanol washed this particle enough, and the vacuum dryer performed reduced pressure drying. It evaluated about frammics reinforcement and an orientation condition as well as [particle / which was obtained] an example 25. The result was shown in Table 4. [0180] The same actuation as example 25 Groduction of the particle which has a reducibility radical on a front face) example 25 was performed.
[01811] [Commission of the graft boolmerization laver which has a functional group) the seed

[0181] (Formation of the graft polymerization layer which has a functional group) the sec

[0181] (Formation of the graft polymerization bayer which has a functional group) the seed particle child 5 weight section obtained by the separable flash by the indrexehaper-water 100 weight section, the isopropyl stochol 30 weight section, the glycidyl methacrystae 43 weight section, and the abover-mentioned actuation — in addition, after making SONIKETA distribute enough, it agitated to homogeneity, Furthermore, it stirred by adding the ammonium persuffate 0.13 weight section and the sodium-hydrogensuffate 0.003 weight section, and making it dissolve enough. The system was once decompressed with the pump, nitrogen gas was introduced after that, and stirring was continued for 30 minutes. The temperature up of this was carried out to 50 degrees C, and the reaction was continued for 2 hours. The system was cooled 2 hours after, the tetrahydrofuran 100 weight section and little hydroquinone were added, and the reaction was stromed.

folis2) Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. This particle was enough washed in the tetrahydrofuren and the vacuum dryer performed reduced pressure

dying.

(0183) (Rection of a long-chain alkyl compound) the particle 10 weight section obtained by the separable flask by the toluene 60 weight section, the triethylamine I weight section, and the above-mentioned actuation — in addition, after making SONIXETA distribute enough, it stirred to homogeneity, Subsequently, the solution which method the staryl amine 10 weight section in the toluene 10 weight section was dropped at the system. The system was stirred under reflux temperature for 6 hours, and the reaction was continued.

temperature for 8 hours, and the reaction was continued.

[0184] Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. Tokene and a methanol washed this particle enough, and the vacuum dryer performed reduced pressure

evaluated about dynamics reinforcement and an orientation condition as well as { particle / which was obtained } an example 20. The result was shown in Table 3. [0169]

|               | カ学教技 (私10個)    | 无效行款包括各             |
|---------------|----------------|---------------------|
| <b>化数料20</b>  | 450            | REPREST             |
| <b>東海州2</b> 1 | 450            | <b>日子の1番に共変配向党会</b> |
| 鬼魔狗22         | 450            | AREAREST            |
| KEM23         | 450            | MERARLET            |
| <b>SEM24</b>  | 400            | REFERENT            |
| E MAN 9       | 450            | 拉子全州に共常配向党生         |
| 11.00M 1 0    | <b>御定符に根</b> 類 | ARRARETY            |
| 比較何):         | 450            | <b>ロデカ用に高水配向発生</b>  |

(0170) The mixed Squor of the diviny/benzene 100 weight section and the benzoyf-peroxide 2 weight section was added to the 35 water-solution 800 weight section of example 25 (production of the particle which has a reducibility radical on a front face) polyvinyl alcohol, it agitated with the homogenizer, and grain refiring was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particler-disenter = 80-micrometer and CV value = 5. When surface analysis was performed in TOF-SIMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

[0171] (Formation of the graft polymerization layer which has a functional group) the seed particle child 5 weight section obtained by the separable flash by the formatchange-water 95 weight section, the hydroxyethyl methacyhate 10 weight section, and the above-mentioned actuation — in addition, after making SONINCETA distribute enough, it agitated to homogeneity. Nitrogen gas was introduced into the system and chaming was continued at 30 degrees C for 3 hours. The second cerium ammonium solution of ritrio acid 10 weight section of 0.1 mols / L adjusted in the 1-N nitrio-acid water solution was added to this, and it reacted to it for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the expected washed this particle enough, and the vacuum dryer performed reduced pressure drying. [0172] (Reaction of a long-chain alkyl compound) the particle 5 weight section obtained by the tokens 80 weight section and the above-membrane filter. Ethanol and an acotone washed this particle enough, and the vacuum dryer performed reduced pressure drying. About the obtained was d

a. (0174) The same actuation as example 26 (production of the perticle which has a reducibility radical on a front face) example 25 was performed.
(Formation of the graft polymerization layer which has a functional group) The same actuation as

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drying. It evaluated about dynamics reinforcement and an orientation condition as well as [particle / which was obtained ] an example 25. The result was shown in Table 4. [0185] The example 29 (production of particle which has reducibility radical on front face) trimethylopropamentriacrylate 50 weight section, the diverybenzeme 40 weight section, and the trimethylolpropana-triscrylate 50 weight section, the divinybanzene 40 weight section, and the scrylonitrile 10 weight section were mixed to homogeneity, the carbon black 12 weight section was added to this, and stirring was performed for 48 hours using the bead mill. The benzoyl-peroxide 2 weight section was mixed into this monomer mixture at homogeneity, and this was further supplied to the 33 wester-solution 550 weight section of polyrinyl alcohol. After stirring enough and performing grain refining, under the nitrogen air current, the temperature up was carried out to 80 degrees C, and the reaction was performed for 15 hours. Not water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle—diameter—50 micrometer and CV value =5.0, and were black. When surface analysis was performed in TOF-SDIS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

particles were mean-particle-diameter =8.0micrometer and CV value =5.0, and were black. When surface analysis was performed in TOF-SMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

(1088) (Formation of the graft polymerization layer which has a functional group) The same actuation as an example 25 was performed.

(Reaction of a long-chain allyl compound) The same actuation as an example 25 was performed.

It evaluated about dynamics reinforcement and an orientation condition as well as [ particle / which was obtained ] an example 25. The result was shown in Table 4.

(1087) The mixed fiquor of the divinylbenzene 80 weight section, the hydroxyethyl methacrylste 20 weight section, and the benzoyl-peroxide 2 weight section was added to the example 30 (production of particle which has raduchibity radical on front face) surface-active-agent high tenor's N-06 (Dei-Ichi Kogyo Seiyaku Co., Ltd. make) 3% water—solution 800 weight section, it agisted with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particles were mean-particle-diameter =8.0micrometer and CV value =5.0. When surface analysis was performed in TOF-SIMS, the OH radical of the hydroxyethyl methacrylsta origin was checked on the front face. The next actuation as an example 25 was performed.

(Reaction of a long-chain skyl compound) The same actuation as an example 25 was performed.

(Reaction of a long-chain skyl compound) The same actuation as an example 25 was performed.

(Resolution was performed by making this particle into a seed particle child.

(10183) (Formation of the graft polymerization layer which has a functional group) The same actuation as an example 25. The result was shown in Table 4.

(10190) (Fo

|               | カ学性度(K10種) | 尤曲计获集准备  |
|---------------|------------|----------|
| 突起的2.5        | 450        | 異常配用発生せず |
| 実施男26         | 4 5 0      | HERRREY  |
| 党基例27         | 450        | 異常記向発生せず |
| 温度抽5.8        | 450        | 異な配用発生せず |
| KEM29         | 400        | HEERREST |
| <b>XEM30</b>  | 426        | REPRET   |
| <b>4883</b> 1 | 450        | 異な紀明発生せず |
| 民物男12         | 450        | REPRE    |

[0193] The mixed liquor of the diviny/benzene 100 weight section and the benzoyl-peroxide 2 weight section was added to the 3% water-polution 800 weight section of example 32 (production of the particle which has a reducibility redical on a front face) polyvinyl alcohol, it agitated with the homogenizer, and grain rafining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating efter that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle after weathing. The obtained particles were mean-particle-diameter =80.0micrometer and CV value =5. When surface analysis was performed in TOF-SIMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was

radical of the polyvinyl slochol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

[0194] (Formation of the graft polymorization layer which has a functional group) the seed particle child 5 weight section obtained by the separable flash by the ion-exchangerwater 95 weight section, the hydrorysthyl methacylate 10 weight section, and the shover-mentioned actuation — in addition, after making SONDKETA distribute enough, it agisted to homogeneity. Nitrogen gas was introduced into the system and churning was continued at 30 degrees C for 3 hours. The second cerking ammonium solution of riting caid 10 weight section of 01 mols / L adjusted in the 1-N nitric-acid water solution was added to this, and it reacted to it for 5 hours. hours. The second cerium ammonium solution of ritric soid 10 weight section of 0.1 mols / L ediptated in the 1-N nitric-soid water solution was added to this, and it reacted to it for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\*e exception with the 3-micrometer membrane filter. Ethanol and an acetone washed this particle snough, and the vacuum dryer performed reduced pressure drying. [0195] (Installation of a polymerization nature viryl group) the particle 5 weight section obtained by the tokene 100 weight section and the above-mentioned actuation by the separable flash—in addition, after making SONIKETA distribute enough, it stirred to homogeneity. Furthermore, the JIRALRIN soid if—theyth tin 0.05 weight section distude with the tokene 10 weight section mixed that the tokene 10 weight section was added, and it stirred enough. The methacrylorysthyl isocyanate 5 weight section disted with the tokene 10 weight section was droped hers, the temperature up of the system was carried out to 80 degrees C after dropping termination, and the reaction was continued for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the 4° exception with the 3-micrometer membrane filter. Ethanol and an acctore washed this particle enough, and the vacuum dryer performed reduced pressure drying. [0196] (Formation of the graft polymerization layer which has an epory group) the particle 5 weight section obtained by the separable flash by the tokene 50 weight section, the glycidyl methacrytate 50 weight section, and the shove-mentioned actuation—in addition, after making SONIKETA distribute enough, it stirred to homogeneity. Nitrogen gas was introduced into the system and stirring was continued at 30 degrees C for I hour. Subsequently, the temperature up of the system was taken 10 weight section was dropped. After continuing a reaction five 4 hours, the benzoyf-peroxide 0.1 weight section was

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the tetrahydrofuran 100 weight section and little hydroquinone were added, and the reaction was stopped. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. This particle ed in the tetrahydrofuran and the vacuum dryer performed reduced pre

drying. (2020) (Installation of a polymerization nature viry/l group) the particle 5 weight section obtained by the toluene 80 weight section and the abover-mentioned actuation by the separable flash — addition, after making SONIKETA distribute enough, it stirred to homogeneity. Furthermore, the methacrylic-acid 5 weight section distribute enough to the toluene 10 weight section was added, and it stirred enough. Subsequently, the temperature up of the system was carried out to 60 degrees C, and the reaction was continued for 5 hours. Reaction mixture was taken out after reaction.

surred enough. Subsequently, the temperature up of the system was carried out to 80 degrees C, and the reaction was continued for 5 hours. Reaction minture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. Ethanol and an acetone washed this particle enough, and the vacuum dryer performed reduced pressure drying.

[2020] (Formation of the graft polymerization layer which has an epoxy group) The same actuation as an example 32 was performed. About the obtained particle, dynamics reinforcement was evaluated like the example 1, and a liquid crystal elution test and adhesive evaluation were performed file the example 8. The result was shown in Table 5.

[20204] The example 36 (production of particle which has reducibility radical on front face) trimethylopropane-triscrylate 50 weight section, the diviny/benzene 40 weight section, and the acrylonizitie 10 weight section were mixed to homogeneity, the carbon black 12 weight section was added to this, and stirring was performed for 48 hours using the bead mill. The benzoyl-peroxide 2 weight section were mixed using the bead mill. The benzoyl-peroxide 2 weight section of this monomer mixture at homogeneity, and this was further supplied to the 3% water-solution 850 weight section of polyvinyl elochol. After stirring enough and performing grain refining, under the nitrogen are current, the temperature up was carried out to 80 degrees C, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle effect washing. The obtained particle enter washing. The obtained particles even mean-particle-diameter =60-micrometer and CV value =50, and were plack. When surface analysis was performed in TOF-SIMS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle enter washing.

(2025) [Committion of the graft polymerization layer which has a functional group) The same actuation as an example 32 was performed.

(Installation of a polymerization nature virty) group) The same actuation as an example 32 was

performed.

(Formstion of the graft polymerization layer which has an epoxy group) The same actuation as a example 32 was performed. About the obtained particle, dynamics reinforcement was evakuated like the example 1, and a liquid crystal elution test and adhesive evakuation were performed like the example 8. The result was shown in Table 5.

the example 8. The result was shown in Table 5. (1200) The mixed figure of the divinybenzene 80 weight section, the hydroxysthyl methacrylate 20 weight section, and the benzoyl-percised 2 weight section was added to the example 37 (production of particle which has reducibility radical on front face) surface-ective-agent high tenor's N-08 (Dai-Ichi Kogyo Seiyalu Co., Ltd. make) 3% water-solution 800 weight section, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen eir current, agitating after that, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter = 5.0 micrometer and CV value = 5.0. When surface analysis was performed in TOF-SIMS, the OH radical of the hydroxyethyl methacrylate origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child. (1201) (Formation of the graft polymerization layer which has a functional group) The same actuation as an example 32 was performed.

(Installation of a polymerization nature vinyl group) The same actuation as an example 32 was performed.

a particle and toluone were carried out the \*\* exception with the 3-micrometer membrane fit.
Toluone and an acetone washed this particle enough, and the vacuum dryer performed reduce
pressure drying. About the obtained particle, dynamics reinforcement was evaluated like the
example 1, and a Equid crystal dution test and adhesive evaluation were performed like the
example 8. The result was shown in Table 5.
[0197] The same actuation as example 33 (production of the particle which has a reducibility

redical on a front faca) example 32 was performed.

(Formation of the graft polymerization layer which has a functional group) The same actuation as an example 32 was performed.

(Installation of a polymerization nature vinyl group) The same actuation as an example 32 was

(Installation of a polymerization nature virul group) The same actuation as an example 32 was performed. 
(Formation of the graft polymerization layer which has an epony group) Instead of the glycidyl methacrytate 50 weight section, the same actuation as an example 32 was performed except having considered as the glycidyl methacrytate 30 weight section and the methyl methacrytate 20 weight section. About the obtained particle, dynamics reinforcement was evaluated like the example 3, and a liquid crystal elution text and adhesive evaluation were performed like the example 8. The result was shown in Table 5.

[1983] The same actuation as example 34 (production of the perticle which has a reducibility radical on a front face) example 32 was performed.

(Formation of the graft polymerization layer which has a functional group) The same actuation as an example 32 was performed.

(Installation of the active group which has polymerization initiation ability) the particle 5 weight section, and the abover-mentioned actuation — in addition, after making SONDETA distribute enough, it stirred to homogeneisty. The 4 and 4-accidis—4-reyardor valoricacid chloride 5 weight section, and the abover-mentioned actuation — in addition, after making SONDETA distribute enough, it stirred to homogeneisty. The 4 and 4-accidis—4-reyardor valoricacid chloride 5 weight section, and the exerception with the 3-micrometer membrane filter. Dimethylformamide, the methanol, and the accidence washed this particle enough, and the vacuum dryer performed reduced pressure drying.

(Formation of the graft polymerization layer which has an epony group) the particle 5 weight section was dropped at the section that the security of the particle the weight section the deviated by the security of the best of weight has an epony group) the particle to weight section the deviated by the security of the best of weight the section the deviated by the security of the section of the graft polymerization layer which has an epony group) the particle 5 weight secti

Dimethylfornamide, the methanol, and the acotione washed this particle enough, and the vacuum drye performed reduced pressure drying.

(Formation of the graft polymerization layer which has an epoxy group) the particle 5 weight acotion obtained by the separable flash by the toluene 50 weight section, the dycidyl methacrylate 30 weight section, and the above-mentioned actuation — in addition, after making SONIXETA distribute enough, it stirred to homogeneity. Nitrogen gas was introduced into the system and string was continued at 30 degrees C for 1 hour. Subsequently, the temperature up of the system was carried out to 70 degrees C, and the reaction was continued for 7 hours.

[0199] Reaction mixture was taken out after reaction termination, and after collecting the homopolymers which have separated with toluene, a particle and toluene were carried out to 40 exception with the 3-micromater membrane filter. Toluene and an acctone wished this particle enough, and the vacuum dryer performed reduced pressure drying. About the obtained particle, dryamnics reinforcement was evaluated files the example 1, and a liquid crystal shution text and adhastive evaluation were performed like the example 8. The result was shown in Table 5. [0200] The same actuation as example 35 production of the particle which has a reducibility radical on a front face) example 32 was performed.

[0201] Formation of the graft polymerization layer which has a functional group) the seed particle child 5 weight section obtained by the separable flash by the ion-exchange-water 100 weight section, the sporopyl alcohol 30 weight section, the phycidyl methacrylate 45 weight section, the sopropyl alcohol 30 weight section, the procedy methacrylate 45 weight section, the sopropyl alcohol 30 weight section, the procedy methacrylate 45 weight section, the sopropyl alcohol 30 weight section, the procedy weight section, and making it described and the sodium-mentioned exclusion — in addition, after making SONIXETA distribute enough, it agitated to homogenei

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(Formation of the graft polymerization layer which has an epoxy group) The same actuation as an example 32 was performed. About the obtained particle, dynamics reinforcement was avaluated like the example 1, and a liquid crystal elution test and adhesive evaluation were performed like the example 8. The result was shown in Table 5. [0208] The mixed liquor of the divry/benzene 100 weight section and the benzoy/-peroxide 2 weight section was added to the 33 water-solution 800 weight section of example of comparison 13 polyvinyl alcohol, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen sir current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification actuation for the obtained particle sifter washing. The obtained particles were mean-particle-dismerter-80 micrometer and CV value 5. About the obtained particles dynamics reinforcement was evaluated like the example 1, and a liquid crystal elution test and adhesive evaluation were performed file the example 1, and a liquid crystal elution test and adhesive evaluation were performed file the example 8. The result was shown in Table 5. dynamics reinforcement was evaluated like the example 1, and a liquid crystal elution test and schesive evaluation were performed like the example 6. The result was shown in Table 5. [0209] 80g of particles obtained in the example 13 of example of comparison 14 comparison was mixed in the alcoholic solvent, and 5g of 0.2-micrometer methyl methecrylate-glycidyl methecrylate copolymerization particles was made to stick to them. This was made to cover with heat treatment and the particle which has a reaction layer was compounded. About the obtained particle, dynamics reinforcement was evaluated like the example 1, and a liquid crystal elution test and achesive evaluation were performed like the example 8. The result was shown in Table

[0210] The mixed liquor of the diviny/benzene 20 weight section, the hydroxyethyl methecrylate [0210] The mixed liquor of the divinythenzons 20 weight section, the hydrozyethyl methacrylate 80 weight section, and the benzoyl-promide 2 weight section was added to the example of comparison 15 surface-active-agent high tenor's N-08 (Dai-Lohi Kogro Seiyaku Co., Ltd. make) 73 water-solution 800 weight section, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter =8 Omicrometer and CV value =50. When surface analysis was performed in TOF-SIMS, the OH radical of the hydroxyethyl methacytate origin was checked on the front face. About the obtained particle, dynamics reinforcement was evaluated like the ple I, and a liquid crystal elution test and adhesive evaluation were performed like the ple 8. The result was shown in Table 5.

example 8. The result was shown in Table 5.

(U211) The same actuation as example of comparison 16 (production of the particle which has a reducability radical on a front face) example 32 was performed.

(Formation of the graft polymerization layer which has a functional group) The same actuation as an example 32 was performed.

(Installation of a polymerization nature vinyl group) The same actuation as an example 32 was

performed. (Formation of the graft polymerization layer which has an epoxy group) instead of glycidyl methacrylate, the same actuation as an example 32 was performed except having considered at the methyl methacrylate 50 weight section. About the obtained perticle, dynamics reinforcemen was ovaluated like the example 1, and a liquid crystal solution test and adhesive evaluation were performed like the cample 8. The result was shown in Table 5.

|              | 力学権度<br>(K 1 0 億) | 条項出版は<br>さよづ時は<br>(※) 乳料の基礎 | 代療性<br>1770- 統集<br>改領事(X) |
|--------------|-------------------|-----------------------------|---------------------------|
| <b>実施料32</b> | 450               | 100                         | 9.5                       |
| 电路斜33        | 450               | 100                         | 2.6                       |
| <b>現底例34</b> | 450               | 100                         | 80                        |
| 実施男35        | 450               | 100                         | 9.3                       |
| <b>RM#16</b> | 400               | 100                         | 94                        |
| 突延門37        | 420               | 100                         | 9.5                       |
| 抗酸铜13        | 450               | 100                         | 3.5                       |
| EE111        | 450               | 91. 6                       |                           |
| 比吸押15        | 自定的に収益            | 100                         | 84                        |
| -            | 450               | 100                         |                           |

[0213] The mixed liquor of the diviny/benzene 100 weight section and the benzoyf-peroxide 2 (UZI)] the mixed leuor of the diverglencere IUU weight section and the benzoyr-personal z weight section was added to the 35 water-solution 800 weight section of example 38 (production of the particle which has a reducibility radical on a front face) polyvinyl elochol, it agitated with the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating efter that, and the reaction was performed for

the homogenizer, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Thermion exchange water and a methanol performed classification sctustion for the obtained particle after washing. The obtained particles were mean-particle-diameter = 6.0 micrometer and CV value = 5. When surface analysis was performed in TOF-SIMS, the OH radical of the polyndry alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

[0214] (Formation of the graft polymerization layer which has a functional group) the seed particle child 5 weight section obtained by the separable flash by the ion-exchange-water 95 weight section, the hydroxyethyl methacytate 10 weight section, and the above-mentioned actuation — in addition, after making SONIXETA distribute enough, it agisted to homogeneity. Nitrogen gas was introduced into the system and chuming was continued at 30 degrees C for 3 hours. The second cerium ammonium solution of nitric social 10 weight section of 0.1 mols / L educated in the 1-N nitric-social water solution was added to this, and it reacted to it for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the exe exception with the 3-micrometer membrane filter. Ethanol and an sectone washed this particle enough, and the vaccum dryer performed reduced pressure drying. [0215] (Installation of a polymerization nature vinyl group) the particle 5 weight section obtained by the tobene 10 weight section was dropped here, the temperature to of the system was carried out to 80 degrees C after dropping termination, and the reaction was continued for 5 hours. Reaction mixture was taken out after reaction temperature to of the system was carried out to the particle the execution with a dropped here, the temperature 5 weight section dutated with the tobane 10 weight section steary) methecrylate 50 weight section, and the above-mentioned actuation—in addition, after making SONIKETA distribute enough, it stirred to homogeneity. Nitrogen gas was introduced into the system and stirring was continued at 30 degrees C for 1 hour. Subsequently, the temperature up of the system was carried out to 60 degrees C, and the benzoyl-peroxide 0.1

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dissolve enough. A system is once decompressed with a pump, nitrogen gas is introduced after that, and it is 30-minute stirring \*\*\*\*\*\*\*\*\*. The temperature up of this was carried out to 50 degrees C, and the reaction was continued for 2 hours. The system was cooled 2 hours after, the tetrahydrofuran 100 weight section and little hydroquinone were added, and the reaction was stopped. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3 micrometer membrane fifter. This particle was enough washed in the tetrahydrofuran and the vacuum dryer performed reduced pressure

(0226) Installation of a polymerization nature vinyl group) the particle 5 weight section obtained by the tokene 80 weight section and the above-mentioned actuation by the separable flask — in addition, after making SONIKETA distribute enough, it stirred to homogeneity. Furthermore, the methacrytic-socid 5 weight section diluted with the tokene 10 weight section was added, and it methacrytic-acid 5 weight section diluted with the taluene 10 weight section was added, and it stirred enough. Subsequently, the temperature up of the system was carried out to 80 degrees C, and the reaction was continued for 5 hours. Reaction mixture was taken out after reaction termination and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. Ethanol and an acetone washed this particle enough, and the vacuum dryer performed reduced pressure drying. [0227] (Formation of the graft polymerization layer which has a long-chain alkyl group) The same actuation as an example 38 was performed. About the obtained particle, evaluation of dynamics reinforcement and an orientation condition was performed like the example 38. The result was shown in Table 8. [0228] The example 42 (production of particle which has reducibility radical on front face) trimethylobropane-trisorylate 50 weight section, the divinybenzene 40 weight section, and the

[0228] The example 42 (production of particle which has reducibility radical on front face) trimethylotypopane-triacrylate 50 weight section, the diverylbenzere 40 weight section, and the acrylonitrile 10 weight section were mixed to homogeneity, the carbon black 12 weight section was added to this, and stirring was performed for 48 hours using the bead mill. The benzoyit-peroxide 2 weight section was mixed into this monomer mixture at homogeneity, and this was further supplied to the 3% water-solution 850 weight section of polyvinyl slochol. After stirring enough and performing grain refining, under the nitrogen air current, the temperature up was carried out to 80 degrees C, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-dismeter =8.0micrometer and CV value =5.0, and were black. When surface analysis was performed in TOF-SDAS, the OH radical of the polyvinyl alcohol origin was checked on the front face. The next actuation was performed by making this particle into a seed particle child.

(2229) (Formation of the graft polymerization layer which has a functional group) The same

particle child. (0229) (Formation of the graft polymerization layer which has a functional group) The same actuation as an example 38 was performed. (Installation of a polymerization nature viring group) The same actuation as an example 38 was

(Committion of the graft polymerization layer which has a long-chain alkyl group) The same actuation as an example 38 was performed. About the obtained particle, evaluation of dynamics reinforcement and an orientation condition was performed like the example 38. The result was

reinforcement and an orientation condition was performed like the example 38. The result was shown in Table 6. (D230) The mixed liquor of the diviny/benzone 80 weight section, the hydroxyethy/ methacrylat 20 weight section, and the benzoy/peroxide 2 weight section was added to the example 43 aurface—active—agent high tenor/s N-80 (Dai-lich Koppo Senjaku Co, Ltd make) 3% water—solution 800 weight section, it agitated with the homogenizor, and grain refining was performed. The temperature up was carried out to 80 degrees C under the nitrogen air current, agitating after that, and the reaction was performed for 15 hours. Hot water and a methanol performed classification actuation for the obtained particle after washing. The obtained particles were mean-particle-diameter =8,0micrometer and CV value =5.0. When surface analysis was performed in TOF-SIMS, the OH radical of the hydroxyethyl methacrylate origin was checked the front face. The next actuation was performed by making this particle into a seed particle child.

[0231] (Formation of the graft polymerization layer which has a functional group) The same

weight section melted in the toluene 10 weight section was dropped. After continuing a reaction for 4 hours, the benzoyl-peroxide 0.1 weight section further melted in the toluene 10 weight section was dropped, and the reaction was continued for 4 hours.

[0217] Reaction mixture was taken out after reaction termination, and after collecting the homopolymers which have separated with toluene, a perticle and toluene were carried out the exception with the 3-micrometer membrane filter. Toluene and an acctone washed this particle exception with the 3-micromater membrane filter. Toluene and an acctone washed this particle enough, and the vacuum dryer performed reduced pressure drying. About the obtained particle, dynamics reinforcement was evaluated like the example 1, and the orientation condition was evaluated like the example 20. The result was shown in Table 6. [D218] The same actuation as example 39 (production of the particle which has a reducibility radical on a front face) example 38 was performed. (Formation of the graft polymerization layer which has a functional group) The same actuation as an example 38 was performed.
(Installation of a polymerization nature viryll group) The same actuation as an example 38 was performed.

performed.

(Q19) (Formation of the graft polymerization layer which has a long-chain allul group.) The same actuation as an example 38 was performed except having used the octyl methacrylate 30 weight section and the methyl methacrylate 20 weight section instead of stearyl methacrylate. About the obtained particle, evaluation of dynamics reinforcement and an orientation condition was performed like the example 38. The result was shown in Table 6.

(Q20) The same actuation as example 40 (production of the particle which has a reducibility redical on a front face) example 38 was performed.

(Formation of the graft polymerization layer which has a functional group) The same actuation as a example 38 was performed.

(Formation of the graft polymerization layer which has a functional group) the same actuation as a sample 38 was performed.

[D221] Orstallation of the active group which has polymerization initiation ability) the particle 5 weight section obtained by the apparable flash by the dimethyformamide 30 weight section, the triethyformac 5 weight section, and the above-mentioned actuation — in addition, after making SONDIETA distribute enough, it stirred to homogeneity. The 4 and 4-azobis-4-cyano valerio-acid chloride 5 weight section dissolved in the dimethyformamide 10 weight section was dropped at this. After continuing a reaction for 4 hours, reaction mixture was taken out and reaction mixture was carried out to the particle the \*\* exception with the 3-micrometer membrane filter. Dimethyformamide, the methanol, and the acetone weshed this particle enough, and the vacuum

Directlyformamide, the methanol, and the acctoring washed this particle enough, and the vacuum dryer performed reduced pressure drying. [0222] (Formation of the graft polymerization layer which has a long-chain alkyl group) the particle 3 weight section obtained by the separable flash by the tolurene 50 weight section, the stearyl methacrylate 50 weight section, and the above-mentioned actuation — in addition, after making SONINETA distribute enough, it stirred to homogeneity. Nitrogen gas was introduced into the system and stirring was continued at 30 degrees C for I hour. Subsequently, the temperature up of the system was carried out to 70 degrees C, and the reaction was continued for 7 hours.

for 7 hours. [0223] Reaction mixture was taken out after reaction termination, and after collecting the [0223] Reaction mixture was taken out after reaction termination, and after collecting the homopolymers which have separated with toluene, a particle and toluene were carried out the \*\* exception with the 3-micrometer membrane filter. Toluene and an actione assisted this particle enough, and the vacuum dryer performed reduced pressure drying. About the obtained particle, evaluation of dynamics rainforcement and an orientation condition was performed like the example 38. The result was shown in Table 6. [10224] The same actuation as example 41 (production of the particle which has a reducibility radical on a front fiscal example 38 was performed. [10255] (Formation of the graft polymerization layer which has a functional group) the seed particle chalf 5 weight section obtained by the separable flask by the ion-exchange-water 100 weight section, the isopropyl alcohol 30 weight section, the glycidyl methacrystae 45 weight section, and the above-mentioned actuation — in addition, after making SONIKETA distribute enough, it agistated to homogenity. Furthermore, it stimed by adding the ammorium persulfate 0.15 weight section and the sodium-hydrogencarbonate 0.003 weight section, and making it

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ectuation as an example 38 was performed. (Installation of a polymerization nature viryl group) The same actuation as an example 38 was

(Formation of the graft polymorization layer which has a long-chain alkyl group) The same actuation as an example 38 was performed. About the obtained particle, evaluation of dynamic reinforcement, and an orientation condition was performed like the example 38. The result was

shown in Table 6.
[0232] The same actuation as example of comparison 17 (production of the particle which has a reducibility radical on a front face) example 38 was performed.

(Formation of the graft polymerization layer which has a functional group) The same actuation as an example 38 was performed.

(Installation of a polymerization nature virul group) The same actuation as an example 38 was

performed.

(023) (Formation of the graft polymerization layer which has a long-chain alkyl group) The same actuation as an example 38 was performed except having used the methyl methacrylate 50 weight section instead of stearyl methacrylate. It evaluated about dynamics reinforcement and an orientation condition as well as [ particle / which was obtained] an example 38. The result an orientation condition was shown in Table 6.

| [ I able b]  |               |                     |
|--------------|---------------|---------------------|
|              | 力学協定(K 1 0 號) | 光並行於無評価             |
| 実施例3.8       | 450           | 異常配向発生せず            |
| 突延的39        | 450           | <b>教子の1部に異常配向発生</b> |
| <b>水抵押40</b> | 450           | 異常配向発生サブ            |
| <b>双版例41</b> | 450           | 異常配向発生せず            |
| 亥施男42        | 400           | 其常配向発生せず            |
| 灾监例4.3       | 420           | 異常配物発生セプ            |
| 比较例17        | 450           | 粒子会用に食金配内児生         |

## [0235]

[0735] [Effect of the Invention] Functionality, such as abnormality orientation prevention engine performance, is given holding the dynamics reinforcement needed for a spacer, since the spacer for fiquid crystal display components of this invention consisted of an above-mentioned configuration. For this reason, if the spacer for liquid crystal display components of this invention is used, the adhesion of the abnormality orientation phenomenon of liquid crystal and a spacer, spraying rature, etc. can be improved easily, and the liquid crystal display component from which a homogeneous and good image is obtained can be offered.

[Translation done.]

# \* NOTICES \*

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- 1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

## **DESCRIPTION OF DRAWINGS**

[Brief Description of the Drawings]

[Drawing 1] It is the type section Fig. showing the liquid crystal display component of this invention.

[Description of Notations]

- 1 Seal Member
- 2 Transparence Substrate
- 3 Transparent Electrode
- 4 Orientation Control Film
- 5 Transparence Substrate
- 6 Transparent Electrode
- 7 Orientation Control Film
- 8 Substrate
- 9 Spacer
- 10 Substrate
- 11 Pneumatic Liquid Crystal
- 12 Polarization Sheet
- 13 Polarization Sheet

[Translation done.]